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ABSTRACT

An issue of paramount concern is the supply and quality of human resources available for scientific and technological activities of the United States. Science and engineering (S&E) personnel are vital in meeting challenges in areas such as scientific research, education, technological competitiveness, and national defense. The growing demand for scientists and engineers, in combination with the current decline in the college-age population makes it essential that every available source of personnel be developed. However, women, racial and ethnic minorities, and persons with physical disabilities have historically been underrepresented among scientists and engineers. A clear and factual picture of the situation and trends in participation is very important to rational and effective policy formation. This volume, the fifth in a series, is designed to provide the essential information to the U.S. Congress, the Administration, and others concerned with the overall strength of U.S. science and engineering and the provision of equal opportunities and equal treatment for women and minorities in this area. Specifically examined are: (1) the population of women scientists and engineers including employment characteristics; (2) the experiences of women in science and mathematics at all educational levels; (3) the differing experiences and characteristics of Blacks, Asians, Native Americans, and Hispanics in the U.S. science and engineering population; (4) minority experience in U.S. educational institutions; and (5) the employment characteristics of persons with physical disabilities in the U.S. science and engineering population. Appendices include technical notes and statistical tables. (CW)

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women and minorities in science and engineering

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foreword

An issue of paramount concern is the supply and quality of human resources available for this country's scientific and technological activities. Science and engineering (S&E) personnel are vital in meeting national challenges in areas such as scientific research, education, technological competitiveness, and national defense.

The growing demand for scientists and engineers, in combination with the current decline in the college-age population makes it essential that every available source be used. However, women, racial and ethnic minorities, and persons with physical disabilities have historically been underrepresented among scientists and engineers.

Underrepresentation raises important concerns. The first is whether or not these groups have the same access to education in S&E fields as the majority. The second is whether underrepresented groups with requisite education have similar opportunities in S&E employment. Differing experiences may result for several reasons including differences in socioeconomic characteristics, career preferences, or a combination of factors; they may also result from inequitable treatment.

A clear and factual picture of the current situation and recent trends in participation is very important to rational and effective policy formulation. This volume, the fifth in a series, is designed to provide the essential information to the Congress, the Administration, and others concerned with both the overall strength of U.S. science and engineering and the provision of equal opportunities and equal treatment for women and minorities in this area.

Erich Bloch
Director
National Science Foundation

acknowledgements

This report was developed within the Division of Science Resources Studies, Surveys and Analysis Section, by Melissa J. Lane, Economist, Scientific and Technical Personnel Characteristics Studies Group (STPCSG), under the direction of Michael F. Crowley, Study Director, STPCSG. Carolyn F. Shettle, Senior Science Resources Analyst, STPCSG, also made substantial contributions to the analysis. Nita Congress provided professional editing services; David Edson and Susan Holland of Mathematica Policy Research, Inc., generated the data on the science and engineering population as well as the statistical tables appearing in this report; and Patricia D. Hughes of NSF's Printing Services Branch coordinated production of the document.

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executive summary

This report, the fifth in a biennial series mandated by the Science and Technology Equal Opportunities Act (Public Law 96-516) of 1980, presents information on the participation of women, racial/ethnic minorities, and persons with physical disabilities in science and engineering (S/E). In keeping with its purpose as an information resource, this report makes no recommendations on programs or policies. The report does present information that may be used to address issues concerned with the full utilization of the Nation's human resources in science and engineering.

Several major themes emerge from the data and analyses in this report:

- *Despite rapid growth between 1978 and 1988, women, blacks, and Hispanics continue to be underrepresented in S/E employment based on their representation in the overall U.S. workforce.*
- *Underrepresentation is more acute in engineering and some natural science fields than in the life or social sciences.*
- *The general underrepresentation of women and minorities reflects a number of factors, including their relatively low participation in precollege science and mathematics courses and in undergraduate and graduate science and engineering education programs.*
- *Women and minorities who complete their education in S/E fields and seek employment in the S/E workforce generally encounter higher unemployment rates and earn lower annual salaries than the majority.*
- *The fundamental concern for underrepresented minorities is the quality of their educational experiences. Lower performance by these groups in mathematics and science emerges as early as the elementary school level.*

Some of the specific findings presented in this report on women, racial minorities, Hispanics, and persons with physical disabilities are summarized below.

EMPLOYMENT IN THE SCIENCE AND ENGINEERING WORKFORCE

Women

Women account for 1 in 3 scientists and only 1 in 25 engineers.

- Employment of women scientists and engineers increased by 258 percent (14 percent per year) to 868,000 between 1978 and 1988, compared to an 87-percent (6 percent per year) increase for men. In 1988, women accounted for 16 percent of the S/E workforce, up from 9 percent in 1978. Women continue to constitute a smaller proportion of the S/E workforce than they do of either total U.S. employment (45 percent) or total employment in professional and related occupations (50 percent).
- Representation of women varies substantially by S/E field. In 1988, almost 1 in 3 scientists was a woman compared to only 1 in 25 engineers. Among sci-

ence fields, the proportion of women ranged from 11 percent of environmental scientists to 48 percent of psychologists.

- Because of their relatively recent influx into science and engineering fields, women generally are younger and have fewer years of professional experience than men. In 1986 (the latest year in which data are available), almost three-fifths of women—but only about one-quarter of men—had fewer than 10 years' experience.

Women's salaries are lower than men's in essentially all S/E fields and at all levels of professional experience.

- Annual salaries for women scientists and engineers averaged 75 percent of those for men in 1986 ($29,900 versus $39,800). Women's salaries are lower than men's in essentially all S/E fields and at all levels of professional experience. There were a few exceptions at the entry level, however, where salaries were comparable: for example, salaries for recent bachelor's degree recipients in engineering were virtually identical, regardless of gender.
- The unemployment rate for women was about double that for men in 1986: 2.7 percent versus 1.3 percent. Unemployment rates for both women and men have declined since 1976 when they were 5.4 percent and 3.2 percent, respectively.
- Available data show greater S/E underemployment of women than of men among scientists and engineers. If those working involuntarily in either part-time or non-S/E jobs are considered as a proportion of total employment, about 6 percent of women, compared to 2 percent of men, are underemployed.

Minorities are more highly represented among women than among men.

Minority Women

- Minorities are more highly represented among women than among men. Of the 698,600 employed women scientists and engineers in 1986, roughly 5 percent were black (34,500) and 5 percent were Asian (36,300); less than 1 percent (2,700) were native American. On the other hand, in 1986, about 2 percent of male scientists and engineers were black, 5 percent were Asian, and less than 1 percent were native American.
- Asian women are more highly represented among scientists and engineers than in the general workforce. While they account for about 5 percent of women scientists and engineers, they represent only about 2 percent of all women in the U.S. workforce. Black women account for 11 percent of all employed women and 5 percent of women scientists and engineers.
- In 1986, almost 3 percent (19,600) of women scientists and engineers were Hispanic, compared with 6 percent of all employed women.

About 5 percent of scientists and engineers are Asian and 2.6 percent are black.

Racial Minorities

- In 1988, blacks accounted for 2.6 percent (139,000) of all employed scientists and engineers. Although this proportion was up from 1.8 percent in 1978, it was still lower than their proportion more generally. Blacks accounted for 10 percent of total U.S. employment in 1988 and almost 7 percent of all employed professional and related workers.
- Asians represented about 5 percent (268,000) of all scientists and engineers in 1988, but only about 2 percent of the overall U.S. labor force.
- The representation of native Americans is about the same among scientists and engineers as in the overall U.S. workforce (less than 1 percent). Currently available data on native Americans, however, should be viewed with caution since sample sizes for native Americans are small, and statistical reliability is thus lower for data on this racial group. Additionally, data are based on an individual's perception of his or her native American heritage; such perceptions may change over time.

- Racial groups differ with respect to their participation in S/E fields. The proportions of racial minorities who were engineers ranged from about 56 percent of Asians to 32 percent of blacks. Among scientists, blacks were more likely than either whites or Asians to be social scientists or psychologists.
- Unemployment rates vary by racial group. In 1986, these rates were 3.8 percent (blacks), 1.8 percent (Asians), and 1.2 percent (native Americans). In comparison, the rate for whites was 1.5 percent.

Black scientists and engineers, on average, earn lower salaries than do Asians, native Americans, or whites.

- Underemployment (the fraction of total employment representing those involuntarily working in either a part-time or non-S/E job) for scientists and engineers also varies by race. The S/E underemployment rate for blacks was more than 5 percent; rates for Asians, native Americans, and whites were roughly half this rate.
- Blacks, on average, have fewer years of professional experience than do Asian or white scientists and engineers. Almost 40 percent of blacks, compared to roughly 30 percent each of Asians and whites, had fewer than 10 years of professional experience in 1986. Among native American scientists and engineers, about 20 percent had fewer than 10 years' experience.
- Black, native American, and white scientists and engineers are all just as likely to report management as their major work activity. In 1986, roughly 28 to 30 percent of each group were in management. In contrast, about 22 percent of Asians reported this activity as their major work in 1986.
- Black scientists and engineers, on average, earn lower salaries than do Asians, native Americans, or whites. In 1986, the average annual salary reported by blacks was $31,500. Average salaries for other racial groups ranged from about $39,000 for Asians and whites to $41,000 for native Americans.

Hispanics represented 1.8 percent of the employed scientists and engineers.

Hispanics

- In 1988, Hispanics of all racial groups represented 1.8 percent of the employed scientists and engineers. For the same year, roughly 7 percent of all employed persons, and more than 3 percent of those in professional and related fields, were Hispanic.
- Among Hispanic scientists and engineers, about half were scientists and half were engineers: this split was roughly similar to the overall scientist-engineer split. Hispanics in science are somewhat more likely than all scientists and engineers to be social scientists and less likely to be computer specialists.

About 94,000 scientists and engineers—about 2 percent of the total—reported a physical disability.

- Hispanics report significantly fewer years of professional experience than do all scientists and engineers. Almost 44 percent of Hispanics reported fewer than 10 years' experience in 1986; the comparable figure for all scientists and engineers was 31 percent.
- Hispanic scientists and engineers are more likely than non-Hispanics to be unemployed or underemployed. For example, respective unemployment rates in 1986 were 2.1 percent (Hispanics) and 1.5 percent (non-Hispanics).
- Annual salaries for Hispanics averaged $34,600 in 1986; the average for all scientists and engineers was $38,400.

Persons With Physical Disabilities

- In 1986 (the latest year in which data are available), about 94,000 scientists and engineers—about 2 percent of the total—reported a physical disability. Of these, 23 percent reported an ambulatory condition, 22 percent a visual condition, and 17 percent had an auditory disability. The remainder did not specify the nature of their disability.

- Those reporting a disability are much more likely than all scientists and engineers to be out of the labor force. The 1986 labor force participation rate for disabled scientists and engineers was 76 percent; for all scientists and engineers, the rate was 95 percent. For those in the labor force, both persons with physical disabilities and all scientists and engineers reported an unemployment rate of 1.5 percent.
- The field distribution of employed scientists and engineers with physical disabilities differs only slightly from that of all scientists and engineers.

EDUCATION IN SCIENCE AND ENGINEERING

Precollege Education

Women

- On measures of mathematics achievement at the precollege level, females—who, at younger ages, perform about the same as males—begin to lag behind by age 13. In science, female scores are lower at all ages starting at age 9 and with the differences increasing among older students.
- In 1988, females continued to score lower (13 points) than males on the verbal component of the Scholastic Aptitude Test (SAT), and substantially lower (43 points) on the mathematics portion. Although there have been some fluctuations over the decade, score differences between females and males have increased on the verbal section but have narrowed on the mathematics component.

Females continued to score lower than males on the verbal component of the SAT and substantially lower on the math portion.

- The probability of choosing a science major is slightly greater for females (23 percent) than males (21 percent), but males are significantly more likely to choose engineering (18 percent versus 3 percent). For each S/E field, however, females' math scores on the SAT are lower than males'.

Racial Minorities

- Trends in Scholastic Aptitude Test scores have varied greatly over the 1978-88 decade. Scores for blacks have risen substantially on both the verbal and mathematics components; scores for Asians have increased but not as significantly. For native Americans and whites, scores have increased on the mathematics section and remained about the same on the verbal section.

Scores for blacks have risen substantially on both the verbal and math components; scores for Asians have increased but not as significantly.

- Between 1978 and 1988, scores for blacks on the SAT mathematics component rose 30 points compared to a 5-point increase for whites. In 1988, blacks scored 384 on the mathematics component, 106 points lower than whites (490). In the same year, Asians scored 522 on the mathematics component, 32 points more than whites. The mathematics score for native Americans was 435, 55 points lower than that for whites.

Hispanics

- In 1988, scores for Hispanics were lower than the national average on the SAT verbal component by between roughly 40 and 70 points. Among Hispanics, the highest score was registered by Latin Americans while the lowest was for Puerto Ricans. A language barrier may be one factor contributing to these lower scores for Hispanics. In 1988, between 16 percent and 38 percent of Hispanic seniors reported that English was not the first language they learned. Overall, this proportion was 5 percent.

Undergraduate Education

Women

- Career choices of freshmen who plan to major in science and engineering vary between females and males. While females choose careers in clinical psychology, social work, and the law, males more often focus on engineering and computer programming.

- Score differences between women and men vary among the components of the Graduate Record Examination (GRE). Of women and men with undergraduate majors in S/E fields, women generally scored slightly higher than men on the verbal component, much lower on the quantitative section, and slightly lower on the analytical portion.
- By the mid-eighties, women accounted for about two-fifths (123,000) of S/E bachelor's recipients. By field, they made up 45 percent of the degrees granted in science fields and 15 percent of those in engineering. In 1986, more than two-thirds of women received their degree in either the social sciences, psychology, or the life sciences.
- Between 1976 and 1986, degree production patterns changed markedly. The number of S/E baccalaureates earned by women increased by 29 percent compared with a 2-percent rise for men. By field, the most notable gains for women for the decade have been in computer science (from about 1,100 in 1976 to more than 15,000 in 1986) and in engineering (from 1,400 to 11,200). Although gains have been made in the last decade, however, the number of degrees earned by women has begun to fall off in some fields during the mid-eighties. For example, declines are evident in the life and social sciences and engineering.

By the mid-eighties, women accounted for about two-fifths of S/E bachelor's recipients.

Racial Minorities

- The socioeconomic characteristics of American freshmen vary by racial group. Blacks and Asians estimate their parents' income to be lower than whites', and, subsequently, these freshmen are much more likely to be concerned about financing their education. Additionally—in comparison to whites—a higher fraction of both groups report grants and scholarships as a source of financial assistance.
- Career choices of American freshmen also differ by racial group. Both blacks and Asians aspire to engineering and medical careers in higher proportions than do whites. Elementary and secondary school teaching, however, were chosen by a larger fraction of whites than of any minority group.
- At the bachelor's level, blacks accounted for 5.5 percent (21,300) and Asians for 4.8 percent (18,900) of S/E degrees conferred in 1987. The 1,600 degrees granted to native Americans represented 0.4 percent of the S/E baccalaureates awarded. Since 1977, the number of degrees awarded to blacks has fallen off while degrees granted to Asians have increased significantly.

At the bachelor's level, blacks accounted for 5.5 percent and Asians for 4.8 percent of S/E degrees conferred.

Hispanics

- Hispanic freshmen are more inclined than the average to choose engineering, law, or medicine as probable careers. In comparison, higher fractions of all freshmen were considering careers in business management and precollege teaching.
- Hispanic representation among S/E baccalaureate recipients was 3.8 percent (15,000) in 1987. A decade earlier, Hispanics accounted for 2.8 percent (10,900) of these degrees.

Hispanic representation among S/E baccalaureate recipients was 3.8 percent.

Graduate Education

Women

- In 1988, women accounted for about a third of enrollment in science and engineering graduate programs. Between 1980 and 1988, enrollment of women rose much faster than that of men: 29 percent versus 10 percent.

- In 1986, women received 31 percent (19,000) of all S/E master's degrees, up from 22 percent a decade earlier. They received 41 percent of the science degrees awarded and 12 percent of those granted in engineering. Over the 1976-86 decade, the number of women earning these degrees rose by 59 percent; the number of degrees awarded to men increased by less than 2 percent.
- Women received 32 percent of the doctorates granted in science and 7 percent of the engineering doctorates in 1988; these fractions were up from 22 percent and 2 percent, respectively, in 1978. For the 10-year period, the number of science doctorates earned by women rose 56 percent to 5,100, and engineering Ph.D.s increased 440 percent to almost 300. For men, science degrees awarded between 1978 and 1988 dropped by 3 percent while engineering degrees rose 65 percent.
- Women earning Ph.D.s increased in all science and engineering fields between 1978 and 1988. In science, rapidly growing fields included computer science (up 409 percent to 56 degrees); earth, atmospheric, and marine sciences (up 136 percent to 144 degrees); and physical sciences (up 126 percent to 559 degrees). In engineering, the fastest growth was in the mechanical (up 1,200 percent to 26 degrees) and chemical (up 1,100 percent to 60 degrees) subfields.

Women received 32 percent of the doctorates granted in science and 7 percent of engineering doctorates.

Racial Minorities

- In 1988, 12,000 blacks and 16,000 Asians were enrolled in graduate science and engineering programs. As a percentage of total, these numbers represented about 4 percent and 5 percent, respectively, of overall enrollment.
- Blacks and, especially, Asians account for lower shares of S/E doctorates granted to U.S. citizens than they do of all Ph.D. recipients in these fields. In 1988, about 2.4 percent (487) of all S/E doctorates were black and 18 percent (3,740) were Asian. Among U.S. citizens, these proportions dropped to 1.8 percent (black) and 3.4 percent (Asian).

Blacks and, especially, Asians account for lower shares of S/E doctorates granted to U.S. citizens than they do of all Ph.D. recipients in these fields.

Hispanics

- Almost 10,000 Hispanics—3.3 percent of the total—were enrolled in S/E graduate programs in 1988.
- About 3.3 percent (673) of all S/E doctorate recipients were Hispanic in 1988. Among U.S. citizens only, the Hispanic share of the total fell to 2.5 percent.

introduction

The Science and Technology Equal Opportunities Act, passed in December 1980, calls for the National Science Foundation (NSF)

> . . . to promote the full use of human resources in science and technology through a comprehensive and continuing program to increase substantially the contribution and advancement of women and minorities in scientific, professional, and technical careers, and for other purposes.[1]

Under this act, NSF is required to report to Congress on the status of women and minorities in science and engineering (S/E) professions on a biennial basis. This report is the fifth in the series and—like its predecessors—it provides a comprehensive overview of the participation of women, minorities (including Hispanics), and persons with physical disabilities in science and engineering employment and education.[2]

ORGANIZATION

The report has been designed as a reference document that allows readers to locate information easily on particular subgroups or specific aspects of participation and utilization. The *executive summary* provides a concise overview of findings; these are somewhat expanded upon in the introductory overviews of each chapter.

The body of the report contains five chapters and is organized into three sections.

- The first section focuses on women in science and engineering. Specifically, chapter one examines the representation and utilization of women—including members of racial and ethnic minority groups—in science and engineering. The second chapter addresses acquisition of mathematics and scientific skills and highlights differences in achievement test performance, academic preparation, and degree attainment.
- Chapters three and four of section two present similar information for minority groups, including blacks, Asians, native Americans, and Hispanics.
- The final section, chapter five, gives an overview of information on persons with physical disabilities who are in science and engineering.

COVERAGE

The issues addressed in chapters one and three relate to S/E employment. They include:

- The representation of women and minorities in science and engineering employment,
- Differences in employment characteristics between genders and across minority groups, and
- Measures that indicate underutilization of those with science and engineering skills.

Labor market representation may be assessed by comparing the proportion of employed scientists and engineers who are women and members of minority groups with the proportion of these groups in some relevant population—e.g., overall U.S. employment or all professional and related workers. Level of representation, however, reveals nothing about the experiences of women and minorities once they are in the labor market. These experiences are addressed instead by differences in employment characteristics.

Employment characteristics are analyzed in terms of field and career patterns. Information on field is valuable for at least two reasons:

- To indicate whether women and minorities are underrepresented in some fields vis-à-vis men and the majority, and
- To reveal differences by gender and racial/ethnic group.

Employment opportunities vary by field; these differences may be significant in determining such variations in work characteristics as unemployment and salaries. Career patterns are also important because they may illuminate differences in experiences within fields. These patterns are measured in terms of proportion in management positions; for those employed in academia, tenure status and rank are used as indicators.

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[1] "National Science Foundation Authorization and Science and Technology Equal Opportunities Act," Public Law 96-516, 42 USC 1861 (December 12, 1980).

[2] Note that much of the data on employment characteristics of the overall population of scientists and engineers could not be updated from the fourth report because of a change in the survey schedule. In the past, NSF data on science and engineering personnel were collected biennially. The schedule, however, was changed in 1987, and one of the major surveys that was to be conducted in 1988 was moved to 1989. Consequently, much of the data on the overall population of scientists and engineers in the United States could not be updated for this report. While some estimates have been made for 1988 using a forecasting model, for the most part, information on characteristics of scientists and engineers is for 1986.

The third issue addressed in the employment chapters is the utilization of individuals with S/E education. Insights in this area may be gleaned from various labor market indicators; labor force participation and unemployment rates are standard measures. These rates are useful in assessing whether market conditions for women and minority scientists and engineers differ from those encountered by men and the majority and also by women and minorities in the general population.

Labor force participation rates measure the fraction of the S/E population in the labor force, that is, the proportion working or seeking employment. Low rates suggest that a significant fraction of those with S/E education and skills are not using these skills in a science and engineering or any other job.

A second indicator of utilization is unemployment. Unemployment rates measure the proportion of those in the labor force who are not employed but who are seeking employment. Higher rates for women and minorities may signify that these groups encounter labor market problems different from those of men and the majority in the S/E workforce.

Unemployment rates, however, are incomplete market condition indicators for scientists and engineers. They do not indicate the degree to which those with the necessary education succeed in finding S/E jobs. The National Science Foundation has, therefore, developed the S/E underemployment rate. This rate indicates the extent to which scientists and engineers use their skills. For example, when full-time jobs are not available, individuals may accept part-time jobs. Similarly, when S/E jobs are not available, some individuals accept jobs in other areas. Thus, some part-time employment (i.e., seeking full-time jobs) and some non-S/E employment (i.e., belief that S/E jobs are not available) may indicate underemployment. This rate provides an overall statistical measure of both involuntary part-time and involuntary non-S/E employment.

Observed differences in labor market experiences between women and men and between minorities and the majority highlight possible areas of concern. Although disparities may indicate inequitable treatment, they are not in themselves enough to justify such an inference. Differences may reflect such factors as (1) field and work experience; (2) workers' decisions about the nature of their work involvement; (3) employer personnel practices in areas such as hiring, training, and promotion; and (4) a combination of factors which may include inequitable treatment.

Chapters two and four of this report focus on issues related to *education*, specifically the acquisition of those skills requisite to an S/E career. These issues are of increasing importance for several reasons. For example, the population's changing demographic mix results in a rate of influx for minorities at all educational levels that is higher than that for whites. As a group, however, minorities do not participate in S/E undergraduate and graduate education to the same extent as the majority. It is therefore critical to increase minority participation in S/E education to ensure (1) that they have the same opportunities in and access to the acquisition of skills in mathematics and science, and (2) that all available human resource pools contribute to meeting the demand for S/E personnel.

The education chapters explore differences between women and men and between minorities and the majority in four areas:

- Precollege preparation,
- Undergraduate education,
- Graduate education, and
- Postdoctoral experiences.

Most of the data presented in these chapters are from sources outside the National Science Foundation. Because these data are not all based on regularly recurring surveys, the information presented in previous reports is not always available. Alternative information sources have been substituted where possible.

Scores on standardized tests measuring mathematics and science achievement are used as indicators of participation patterns. For example, students who take fewer years of coursework in mathematics generally score lower on exams measuring mathematical knowledge. Scores on these exams reflect a variety of factors including social, demographic, and economic characteristics. There is, for instance, evidence linking student performance on standardized tests to family income; a disproportionate number of minority families are at lower economic levels.

Whenever possible, data in this report are expressed for 10-year time periods. Because of different collection cycles and data availability, however, time frames vary across data sets. For example, sections on science and engineering personnel generally show four time periods. Employment levels of all scientists and engineers are for 1978-88, but, for those characteristics that are not available for 1988, the 1976-86 time frame is used. Data on doctoral scientists and engineers are for 1977-87 and information for recent science and engineering graduates is for 1980-88.

The appendices of this report contain technical notes (appendix A) and statistical tables (appendix B). The technical notes present information on the underlying concepts, data collection techniques, reporting procedures, and statistical reliability of the primary NSF data sources used in this report.

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chapter 1

women in science and engineering

OVERVIEW

In 1988, there were approximately 868,000 women scientists and engineers employed in the United States, up from 242,000 10 years earlier. These women constituted 16 percent of all scientists and engineers (9 percent in 1978). This proportional change is attributable to a 258-percent increase (14 percent annually) in the employment of women scientists and engineers. For men, the corresponding change was 87 percent (6 percent per year). Women, however, remain underrepresented in science and engineering (S/E) employment compared to the overall U.S. workforce: there, they constituted about 45 percent of all workers. Furthermore, women are more underrepresented among engineers than among scientists. In 1988, only 4 percent of engineers were women compared to 30 percent of scientists.

Women scientists and engineers are more likely than their male colleagues to be unemployed and underemployed. The unemployment rate for women in 1986[1] was 2.7 percent versus 1.3 percent for men. These rates were half the comparable 1976 rates: 5.4 percent (women) and 3.2 percent (men). While the 1986 unemployment rate for women scientists and engineers (2.7 percent) was well below that for all women in the U.S. (7.1 percent), it was comparable to the rate for all women college graduates (2.4 percent).

Women scientists and engineers were three times as likely as men to report being underemployed in 1986: 6.3 percent versus 1.9 percent. They also reported relatively low annual salaries. In 1986, annual salaries for women ($29,900) were approximately three-quarters of those for men ($39,800). Their yearly earnings were also below those for men within individual S/E fields and—with few exceptions—at all levels of professional experience.

Because of the recent influx of women into science and engineering professions, they are generally younger and have fewer years of professional experience than men. Almost 60 percent of women, compared to approximately 25 percent of men, reported fewer than 10 years of professional work experience in 1986.

Relatively few women (or men) scientists and engineers are members of minority groups. In 1986, about 5 percent were black, another 5 percent were Asian, and less than 1 percent were native American. Among men, about 2 percent were black, 5 percent were Asian, and less than 1 percent were native American. Hispanic women also account for only a small fraction (3 percent) of all women scientists and engineers; their representation, however, is lower among men (2 percent). Compared to the overall workforce, only Asians were more highly represented among women scientists and engineers.

EMPLOYMENT LEVELS AND TRENDS

Women continue to constitute a smaller fraction of the science and engineering workforce than they do of total U.S. employment or employment in professional and related occupations. In 1988, women represented 45 percent of all employed persons,[2] and 50 percent of those in professional and related occupations,[3] but only 16 percent of employed scientists and engineers. However, their representation in the S/E workforce has been increasing: in 1978, only 9 percent of scientists and engineers were women.

Women's expanding S/E representation derives from an employment growth rate that substantially exceeded men's over the last decade. Between 1978 and 1988, employment of women rose by 258 percent (14 percent per year) compared to an 87-percent increase for men (6 percent per year).

Employment of women doctoral scientists and engineers has also shown substantial growth over the decade. Between 1977 and 1987,[4] their employment grew by 142 percent (9.2 percent per year) compared to 37 percent (3.2 percent annually) for men. In 1987, there were approximately 67,000 women doctoral scientists and engineers. This number represented 16 percent of the total Ph.D. workforce and was up from 10 percent (28,000) in 1977.

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[1] Because of a change in survey schedules, much of the data on the overall population of scientists and engineers cannot be updated. Therefore, with the exception of information on overall employment levels and field distributions, data on characteristics such as work activities and years of work experience are for 1986.

[2] Council of Economic Advisers, *Economic Report of the President, 1989* (Washington, DC: U.S. Government Printing Office, January 1989), p. 346.

[3] U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, Vol. 36, No. 1 (Washington, DC: U.S. Government Printing Office, January 1989), p. 181. This classification includes nine broad categories of professional occupations: engineering, mathematical and computer science, natural science, health diagnosis, health assessment and treatment, teaching (all educational levels), law, judicial, and other professional specialties.

[4] Data on the characteristics of doctoral scientists and engineers in the United States are from the National Science Foundation's Survey of Doctorate Recipients. This survey has been conducted biennially in odd-numbered years since 1973.

The number of science and engineering degrees awarded to women[5] has increased rapidly in the last decade. Consequently, women accounted for a relatively higher fraction of recent science and engineering graduates. In 1988, about 35 percent of those employed graduates who were granted an S/E baccalaureate in 1986 or 1987 were women as were 27 percent of employed master's degree recipients.[6]

FIELD

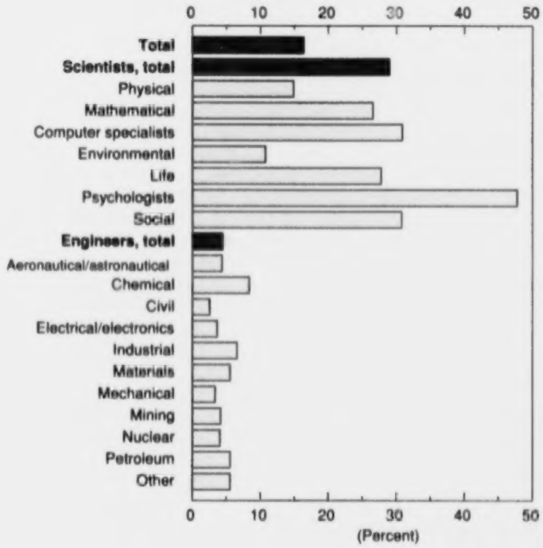
Women represent a much larger proportion of employment in the scientific fields than in engineering (figure 1-1).[7] In 1988, while almost 30 percent of scientists were women, only 4 percent of engineers were female. Among science fields, the representation of women ranged from 11 percent of environmental scientists to 48 percent of psychologists. In engineering, the range was from 3 percent of both mechanical and civil engineers to 8 percent of chemical engineers.

S/E field distributions differ dramatically between women and men (table 1-1), with almost half of all women scientists and engineers concentrated in psychology or the life and social sciences. A majority of men, on the other hand, were engineers.

These field differences between men and women have changed somewhat since 1978 due to differing growth patterns (figure 1-2). The fastest growing science field for both women and men was computer specialties, up 19 percent and 14 percent per year, respectively. In 1988, approximately 25 percent of women and 11 percent of men were computer specialists,[8] compared to 17 percent and 6 percent, respectively, in 1978.

Employment of women engineers has increased more rapidly than that of men over the 10-year period: 16 percent versus 6 percent per year. For both women and men, the fastest growing subfield over the decade was aeronautical/astronautical engineering. Above average employment increases were also registered for women in electrical/electronics and mechanical engineering.

Figure 1-1. Women as a percentage of employed scientists and engineers, by field: 1988



SOURCE: Appendix B; based on table 1.

Table 1-1. Employed scientists and engineers, by field and gender: 1988

Field	Women	Men
Scientists and Engineers	867,900	4,417,400
	Percent	
Total	100	100
Scientists, total	86	41
Physical	5	6
Mathematical	5	3
Computer specialists	25	11
Environmental	1	2
Life	15	8
Psychologists	15	3
Social	19	8
Engineers, total	14	59
Aeronautical/ astronautical	1	3
Chemical	1	3
Civil	1	8
Electrical/ electronics	3	14
Industrial	1	4
Materials	([1])	1
Mechanical	2	11
Mining	([1])	1
Nuclear	([1])	1
Petroleum	([1])	1
Other	4	14

[1] Too few cases to estimate.

Note: Detail may not add to total because of rounding.

SOURCE: Appendix B; based on table 1.

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[5] See chapter 2, "Education of Women in Science and Engineering," for a discussion of trends in S/E degree production among men and women.

[6] Data are from the National Science Foundation's Survey of Recent Science and Engineering Graduates which is conducted biennially in even-numbered years and includes cohorts 1 year and 2 years after graduation.

[7] See appendix A, "Technical Notes," for National Science Foundation definitions of S/E fields.

[8] Data collected in NSF surveys of science and engineering personnel define computer specialists as computer scientists, computer systems analysts, or "other" computer scientists. Computer engineers are classified as engineers. Computer programmers are not included in the classifications.

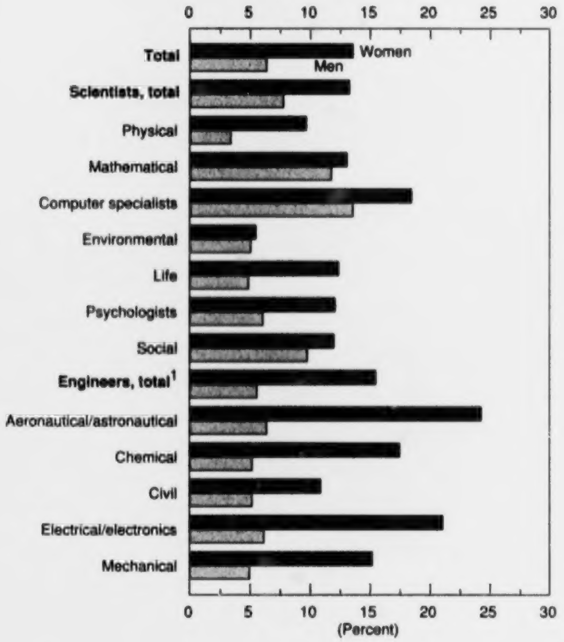

Figure 1-2. Average annual employment growth rates of scientists and engineers, by field and gender: 1978-88

[1] No additional engineering subfields are available for 1978.
SOURCE: Appendix B; based on table 1.

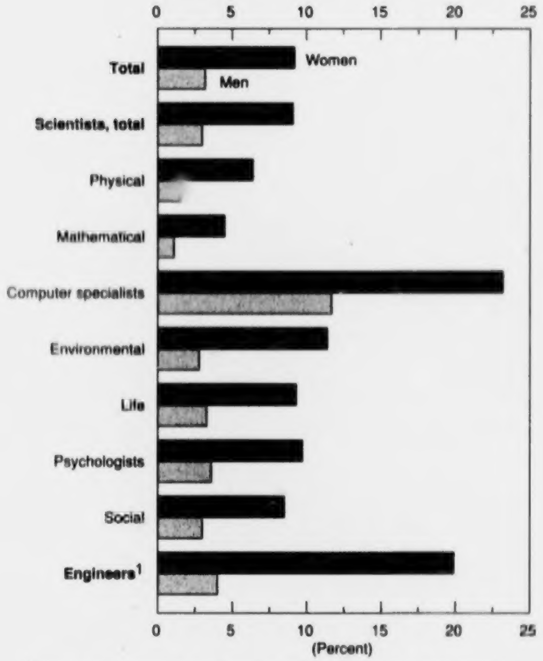

Figure 1-3. Average annual employment growth rates of doctoral scientists and engineers, by field and gender: 1977-87

[1] Because the number of Ph.D. women engineers is small (1,700), growth rates for engineering subfields are not presented.
SOURCE: Appendix B; based on table 3.

The field distribution differences between women and men scientists and engineers may be summarized by using the index of dissimilarity.[9] In 1988, the index measured 47, signifying that 47 percent of women would have to change fields to have a distribution identical to that of men. If the science and engineering workforces are considered separately, the index is 24 in the science workforce and 23 in engineering. Since 1978, the indices have not changed substantially.

Among doctoral scientists and engineers, growth rates for women and men have also varied considerably by field (figure 1-3). Employment of Ph.D. women in the sciences rose at an annual rate of 9.1 percent between 1977 and 1987, compared with 3.0 percent for men. The most rapid growth for women occurred in those fields where the number of employed women was relatively low in 1977, e.g.:

- The number of women doctoral computer specialists rose from about 200 to 1,900 in 1987 (an annual growth of 23 percent), and
- The number of Ph.D. women in engineering rose from about 300 to 1,700, or 20 percent per year.

The above average growth rates in these two fields mirrored trends in degree production. The number of doctorates granted to women in computer science and engineering increased more than for all other S/E fields between 1977 and 1987.

Employed women and men scientists and engineers with doctorates have widely different distributions by field (figure 1-4). Relatively more women (97 percent) than men (81 percent) were scientists in 1987. Over 80 percent of Ph.D. women scientists were in either the life sciences, psychology, or the social sciences; Ph.D. men were concentrated in either the life or physical sciences. Within engineering, women were most likely to be in electrical/electronics engineering (21 percent) in 1987. Interestingly, the index of dissimilarity for doctoral scientists and engineers was 36 in 1987—29 for Ph.D. scientists and only 8 for engineers.

EXPERIENCE

Employment of women scientists and engineers increased more rapidly over the 1978-88 decade than did the employment of men. Thus, women, on average, are younger and have

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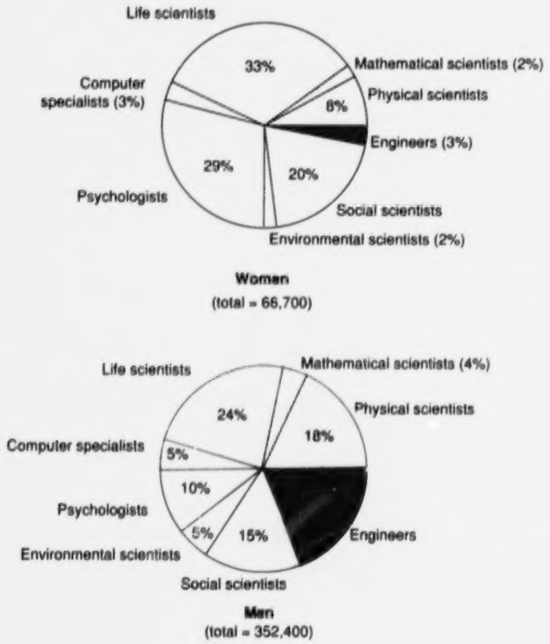
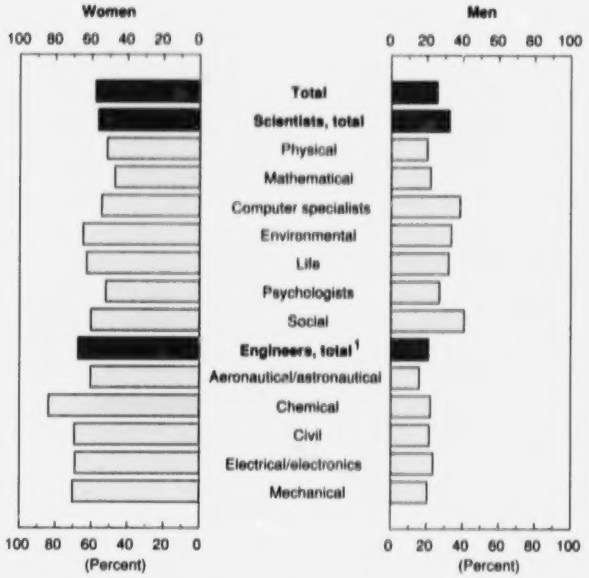
[9] U.S. Commission on Civil Rights, *Social Indicators of Equality for Minorities and Women* (Washington, DC: U.S. Government Printing Office, August 1978), p. 39. "The index . . . represents the percentage of a group who would have to change occupations in order for the group to have identical distributions of a comparison group. If two groups had the same distribution of occupations, the index of dissimilarity would be 0.0 . . ." (p. 44).

Figure 1-4. Employed doctoral scientists and engineers, by field and gender: 1987



SOURCE: Appendix B; based on table 3.

Figure 1-5. Percentages of women and men with fewer than 10 years of work experience, by field: 1986



[1] Includes industrial, materials, mining, nuclear, petroleum, and other.

SOURCE: Appendix B; based on tables 8 and 9.

fewer years of professional experience than their male colleagues. In 1986, almost 60 percent of women scientists and engineers—compared to slightly more than 25 percent of men—had fewer than 10 years' professional experience. Only 15 percent of women, but 46 percent of men scientists and engineers, had more than 20 years of work experience.

Years of work experience for women vary among S/E fields (figure 1-5). For example, in engineering—a field that has seen a very large increase in the employment of women—almost 68 percent of women have less than 10 years of professional work experience. In science fields overall, about 56 percent of women reported fewer than 10 years of work experience.

Doctoral women scientists and engineers also have less work experience than do doctoral men. In 1987, the proportion of women with less than 10 years of work since receiving their doctorate was 59 percent versus 31 percent for men. The fractions of Ph.D. scientists and engineers with 20 years or more of professional experience were 11 percent for women and 30 percent for men.

CAREER PATTERNS

Since there are no direct indicators of career development for scientists and engineers, indirect measures are substituted. One such indirect indicator is the proportion of scientists and engineers in management—especially management of research and development (R&D) activities. In academia, tenure status and faculty rank of doctoral scientists and engineers are useful measures.

Management

Women scientists and engineers are less likely than men to report their primary work as management, whether it be of R&D or other types of activities (e.g., educational programs). In 1986, about 19 percent of women—compared with 29 percent of men—reported management as their major work activity.

Women's engagement in management activities varied substantially by field. For example, among engineers, the difference between female-male managers was 18 percentage points (13 percent for women versus 31 percent for men), compared with an overall 10-point gap. Within the engineering subfields, the proportions of women reporting management as their primary work activity ranged from 6 percent of petroleum engineers to 17 percent of industrial engineers. The range for men was 21 percent of petroleum engineers to 37 percent of civil engineers.

Differences among scientists were not as large as for engineers. About one-fifth of women scientists reported management as their primary work activity, compared with more than one-quarter of men. Moreover, this difference was small in some fields. For example, about 33 percent of women social scientists—compared with 37 percent of men—reported management as their major work.

For those in management, a smaller proportion of women than men report that their primary work was in the research and development area: 24 percent versus 32 percent in 1986. This pattern did not hold across all S/E fields, however (table 1-2). For example, a larger fraction of women managers than men in the social sciences and psychology reported R&D management as their primary work. Among engineers, similar percentages of women and men managers were primarily engaged in managing R&D activities.

Since 1976, the proportion of women who reported management as their primary work activity has risen from 17 percent to 19 percent; concurrently, the proportion of men has dropped from 31 percent to 29 percent. This change is partially accounted for by differences in female-male growth among employment sectors. For instance, two-thirds of all scientists and engineers who reported management as their primary work activity in 1986 were employed in industry. Since growth in the industrial sector has been much more rapid for women than men over the decade, the resulting proportion of industrial female S/E managers has increased.

Table 1-2. Proportions of men and women in management who are primarily engaged in R&D management, by field: 1986

Field	Women	Men
	Percent	
Total	24	32
Scientists, total	22	32
Physical	40	60
Mathematical	35	43
Computer specialists	35	38
Environmental	26	35
Life	24	28
Psychologists	15	14
Social	18	16
Engineers, total	33	32
Aeronautical/ astronautical	25	68
Chemical	30	37
Civil	5	9
Electrical/ electronics	48	47
Mechanical	38	34
Other	36	26

SOURCE: Appendix B; based on tables 14 and 15.

Tenure Status and Academic Rank

Among doctoral level scientists and engineers employed in 4-year colleges and universities, women are less likely than men to be tenured or hold full professorships (table 1-3). In 1987, about 36 percent of Ph.D. women were tenured, compared to almost 60 percent of Ph.D. men.

In 1987, a smaller proportion of doctoral women in 4-year colleges and universities than men held professorial rank (i.e., full, associate, or assistant professor)—72 percent versus 85 percent. Among those with professorial rank, women were much less likely than men to hold full professorships and more likely to hold assistant professorships. Since 1977, however, progress has been made by women. Over the last 10 years, the number of Ph.D. women who were full professors rose 120 percent, compared to a 46-percent increase for men.

Table 1-3. Doctoral scientists and engineers in 4-year colleges and universities, by tenure status, academic rank, and gender: 1987

Tenure status and academic rank	Ph.D. women	Ph.D. men
	Percent	
Tenure status	100	100
Tenure track	58	74
Tenured	36	60
Not tenured	22	14
Non-tenure track	18	7
Other and no report	24	19
Academic rank	100	100
Full professor	18	46
Associate professor	25	24
Assistant professor	29	15
Other and no report	28	15

SOURCE: Appendix B; based on tables 17, 18, 20, and 21.

LABOR MARKET INDICATORS

Labor market indicators[10] such as salaries and unemployment rates are useful in assessing relative market conditions (i.e., employment opportunities relative to available supply). Differences in these market conditions between women and men scientists and engineers may reflect variations in labor market behavior, demographic characteristics, behavior of employers, or a combination of these factors.

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[10] See appendix A, "Technical Notes," for definitions of the labor market rates used in this report.

Labor Force Participation Rates

The labor force participation rates for women and men scientists and engineers were approximately equal (94 percent versus 95 percent) in 1986. These rates are higher than those for both the population in general and the college-educated population in particular. In 1986, about 55 percent of all women and 76 percent of men were in the labor force. For college-educated individuals, the corresponding rates were 73 percent and 88 percent, respectively.[11] Over the decade, participation rates increased for women scientists and engineers from 90 percent in 1976; rates remained stable for men.

Labor force participation rates vary for women among S/E fields (appendix B; table 22). Within science fields, rates for women ranged from 90 percent of life scientists to 97 percent of computer specialists; in engineering, the range was from 90 percent of chemical and electrical/electronics engineers to 99 percent of aeronautical/astronautical engineers in 1986. However, the overall rate for women scientists was the same as that for women engineers: 94 percent.

Women and men scientists and engineers who do not participate in the labor force differ in their reasons for nonparticipation. In 1986, about 34 percent of women nonparticipants reported family responsibilities ("keeping house") as their primary reason; less than 1 percent of men gave this reason. Women also were relatively more likely to report that they were outside the labor force because they were students ("going to school"): 35 percent versus 15 percent. On the other hand, over 75 percent of men—and fewer than 15 percent of women—said that they were retired. Interestingly, the reasons given for nonparticipation were different for women scientists and engineers than for all women. In 1986, about 67 percent of all women cited family responsibilities, 14 percent were retired, and 8 percent were students.[12]

Despite the relatively large fraction of women scientists and engineers outside the labor force because of family responsibilities, most women with children do actively participate in the S/E labor force. In 1986, the participation rate for women scientists and engineers with children present was 93 percent; this rate was about the same as for all women scientists and engineers. Differences in participation exist depending on children's ages. For example, the labor force participation rate for women with children under the age of 6 was 94 percent; for those with children between the ages of 6 and 17, it was only 88 percent.

The labor force participation rates among doctoral scientists and engineers were 93 percent for women and 94 percent for men in 1987 (appendix B; table 23). Rates for women doctoral scientists were lower than those for men, but, among doctoral engineers, rates for women and men were essentially the same.

Among recent S/E graduates who do not attend graduate school on a full-time basis, labor force participation rates for women are also about the same as for men. In 1988, the rates for individuals who received S/E baccalaureates in either 1986 or 1987 were 97 percent (women) and 98 percent (men). At the master's degree level, the corresponding figures were 95 percent and 98 percent, respectively.

Unemployment Rates

Although women and men scientists and engineers participate in the labor force at approximately the same rates, women have a higher unemployment rate than do men. In 1986, the rate for women was more than twice that for men: 2.7 percent versus 1.3 percent. Unemployment rates, however, have fallen for both women and men over the decade. In 1976, rates were 5.4 percent and 3.2 percent, respectively.

The 1986 unemployment rate for women scientists and engineers was considerably below that for all women in the United States (7.1 percent)[13] but was comparable to both the rates for women in professional occupations (2.3 percent)[14] and for women college graduates (2.4 percent).[15]

Unemployment rates by gender vary both between and within science and engineering fields (figure 1-6). Among all science fields, unemployment rates for women were higher than those for men in 1986. The largest difference was between women and men environmental scientists (8.2 percent compared to 3.9 percent). At the other extreme, unemployment rates for women (2.7 percent) and men (2.3 percent) social scientists were quite similar. The lowest rates for both women and men were reported by computer specialists in 1986: 1.6 percent and 0.6 percent, respectively.

Within engineering subfields, rates for women were above those for men with one exception. In 1986, the unemployment rate for women electrical/electronics engineers (1 percent) was approximately equivalent to that for men.

The unemployment rates reported by both women and men doctoral scientists and engineers are lower than those of all scientists and engineers. However, rates for doctoral women were higher than those for their male colleagues among all S/E fields. In 1987, the unemployment rate for women (2.0 percent) was more than twice that for men (0.9 percent).

Over the 1977-87 decade, the unemployment rate for doctoral women has declined from 3.6 percent to 2.0 percent but has remained essentially the same for men. Within fields, women with doctorates had consistently higher unemployment rates than men in 1987.

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[11] Data on labor force participation rates for the general population are from U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, Vol. 34, No. 1 (Washington, DC: U.S. Government Printing Office, January 1987), p. 157. Rates for the college-educated population are from U.S. Department of Labor, Bureau of Labor Statistics, unpublished tabulations.

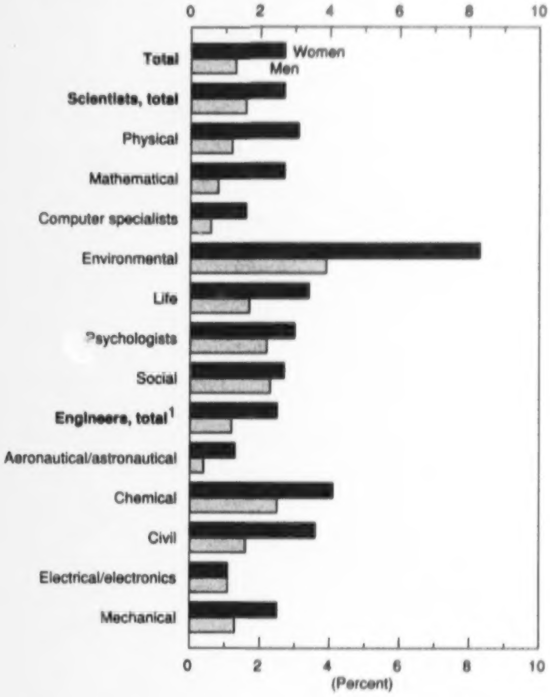
[12] *Employment and Earnings*, Vol. 34, No. 1, p. 197.

[13] Ibid., p. 168.

[14] Ibid.

[15] U.S. Department of Labor, Bureau of Labor Statistics, unpublished tabulations.

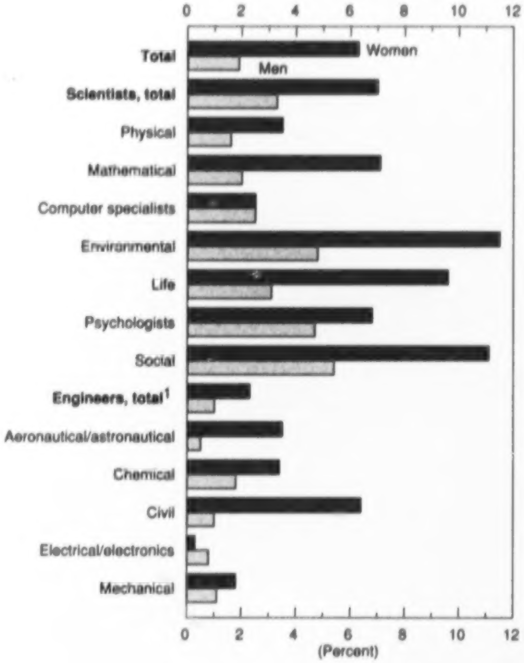
Figure 1-6. Unemployment rates, by gender and field: 1986



[1]Includes industrial, materials, mining, nuclear, petroleum, and other.

SOURCE: Appendix B; table 22.

Figure 1-7. S/E underemployment rates, by gender and field: 1986



[1]Includes industrial, materials, mining, nuclear, petroleum, and other.

SOURCE: Appendix B; table 22.

Unemployment rates for women and men who are recent recipients of S/E degrees are similar at the baccalaureate level but much higher for women at the master's degree level. For those who obtained their degrees in 1986 or 1987, unemployment rates for recent S/E bachelor's recipients in 1988 were 2.6 percent (women) and 2.3 percent (men). At this level, unemployment rates for women were below those for men in mathematics, environmental science, and computer specialties.[16] At the S/E master's degree level, the rate for women (2.4 percent) was substantially higher than that for men (1.4 percent).

S/E Underemployment Rates

The S/E underemployment rate is one measure of underutilization among employed scientists and engineers.[17] For women scientists and engineers, this rate was approximately three times that for men in 1986: 6.3 percent versus 1.9 percent. The rates were higher for women among almost all major fields of science and engineering with the greatest differences existing in science fields (figure 1-7). In science, the underemployment rate for women was 7.0 percent compared to 3.3 percent for men. Only among computer specialties did women and men report the same rate—2.5 percent. In engineering, women had an S/E underemployment rate of 2.3 percent compared to 1.0 percent for men.

Although S/E underemployment rates among doctoral scientists and engineers were lower than those for all scientists and engineers, the rate for women was still higher than that for men. In 1987, they were 3.3 percent and 1.0 percent, respectively.

Salaries

Average annual salaries of women scientists and engineers are lower than those of men. This difference may stem from field distributions, experience levels, employment sectors, labor market behavior, or a combination of these variables.

In 1986, average annual salaries for women ($29,900) averaged about 75 percent of those for men ($39,800). In comparison, ratios of women's salaries to men's among various groups of wage earners in the overall workforce were:

- 67 percent for all full-time wage and salary workers over age 24 (based on median weekly earnings),

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[16] National Science Foundation, *Characteristics of Recent Science and Engineering Graduates: 1988*, detailed statistical tables (Washington, DC: National Science Foundation, in press).

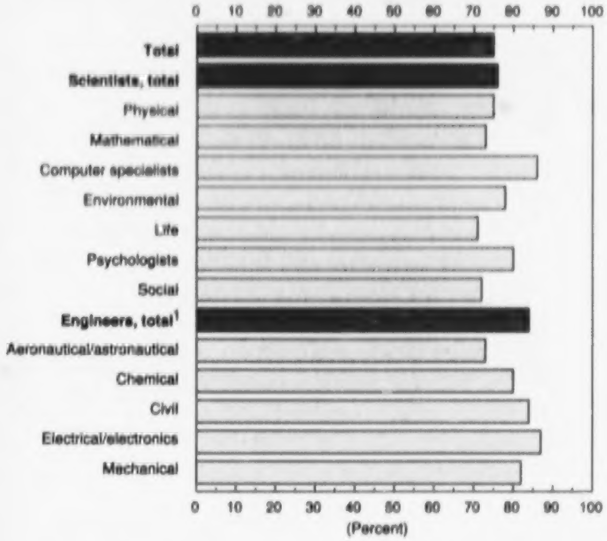
[17] See appendix A, "Technical Notes," for the precise definition of this rate.

- 71 percent for wage and salary workers in professional occupations,[18] and
- 60 percent for all college graduates.[19]

Salaries for women are lower than those for men among all science and engineering fields (figure 1-8). Among scientists, salaries for women averaged 76 percent of those for men. This difference was partially due to the relatively low salaries earned by individuals in psychology, the life sciences, and the social sciences. Among the computer specialties—the fastest growing field for both women and men during the eighties—women's salaries averaged about 86 percent of those for men. For engineers, salaries for females were about 84 percent of those for males, with some fluctuations among major engineering subfields.

Median annual salaries reported by Ph.D. women in 1987 averaged 79 percent of those reported by doctoral men ($40,200 versus $50,700). By field, the ratio for scientists ranged from 78 percent (computer specialties) to 85 percent (psychology). In engineering, salaries for Ph.D. women were approximately 82 percent of those earned by male colleagues. Overall, median annual salaries have risen at approximately the same rate for both women and men over the decade; in 1977, the salary ratio was 80 percent.

Figure 1-8. Women's salaries as a percentage of men's salaries, by field: 1986



[1]Includes industrial, materials, mining, nuclear, petroleum, and other.

SOURCE: Appendix B; based on table 25.

Annual salaries for women and men do not differ as extensively among recent S/E graduates as among all scientists and engineers. In 1988, the median annual salary of 1986 and 1987 women S/E baccalaureate recipients averaged about 81 percent of that for men. This ratio varied considerably by field. For instance, in engineering, it was 100 percent; in psychology, it was 78 percent. At the S/E master's degree level, salaries for women averaged about 86 percent of those for men.

MINORITY WOMEN

The following section focuses first on racial minorities (blacks, Asians, and native Americans) and then on Hispanics. Data presented are limited by the small sample sizes for many of the racial/ethnic groups. The latest data available for all scientists and engineers in the United States are for 1986.

Racial Minorities

Employment Levels and Trends

Racial minorities account for a larger proportion of employed women scientists and engineers than of men scientists and engineers. In 1986, about 11 percent (73,500) of women were members of racial minority groups (blacks, Asians, or native Americans), compared to 7 percent of men.

The racial distribution of women scientists and engineers in 1986 was:

- 87 percent white (608,900),
- 5 percent black (34,500),
- 5 percent Asian (36,300), and
- Less than 1 percent native American (2,700).[20]

The remaining 2 percent were either of mixed racial backgrounds or did not report their race. Among men, about 2 percent were black, 5 percent were Asian, and less than 1 percent were native American.

Black women accounted for a higher fraction of all employed women in the United States (11 percent)[21] than of women in the S/E workforce (5 percent). On the other hand, Asians were more highly represented among women scientists and engineers (5 percent) than among all women in the general workforce (2 percent).[22]

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[18] *Employment and Earnings*, Vol. 34, No. 1, pp. 214-16.

[19] U.S. Department of Labor, Bureau of Labor Statistics, unpublished tabulations.

[20] Data for native Americans should be viewed with caution since the estimates are based on an individual's own classification with respect to native American heritage; such perceptions may change over time.

[21] *Employment and Earnings*, Vol. 34, No. 1, pp. 158-60.

Among doctoral scientists and engineers, about 6,400 women (9.7 percent of all Ph.D. women) were members of racial minority groups in 1987. About 2.9 percent of these (1,900) were black, 6.6 percent (4,400) Asian, and 0.2 percent (100) native American. Comparable proportions for men were 1.3 percent, 9.1 percent, and 0.1 percent, respectively.

Field

Table 1-4 presents S/E field distributions of women within racial groups in 1986. Asians were relatively likely to be engineers. About 20 percent of Asian women were engineers, compared to between 11 percent (native American) and 14 percent (white) of women in other racial groups.

Experience

Across all racial groups, larger fractions of women than men scientists and engineers have less than 10 years of work experience. Among women, white and Asian scientists and engineers were more likely than blacks to report fewer than 10 years' professional work in 1986 (58 percent each for whites and Asians, compared to 52 percent for blacks).

Table 1-4. Field distribution of women scientists and engineers, by racial group: 1986

Field	Total[1]	White	Black	Asian	Native American
	Percent				
Total	100	100	100	100	100
Scientists, total	86	86	87	80	89
Physical	6	5	5	12	([1])
Mathematical	5	5	7	2	4
Computer specialists	23	24	21	24	15
Environmental	2	2	([1])	1	4
Life	15	15	10	15	37
Psychologists	16	17	17	12	19
Social	19	19	27	14	15
Engineers, total	14	14	13	20	11

[1] Too few cases to estimate.
Note: Detail may not add to total because of rounding
SOURCE: Appendix B; based on table 2.

Career Patterns

The proportion of women scientists and engineers who reported management as their primary work activity varied among racial groups. In 1986, black women (24 percent) were most likely to be engaged primarily in management activities, followed by Asian women (22 percent) and white women (19 percent). Within all racial groups, lower proportions of women than men reported their major work as management.

Other indicators of career patterns are tenure status and academic rank. In 1987, Ph.D.-level black women were more likely (64 percent) to be in tenure-track positions—either tenured or waiting for tenure—than were white (59 percent) and, especially, Asian women (43 percent). Interestingly, however, of those who were in tenure-track positions, blacks were least likely to be tenured (50 percent for blacks, compared to 62 percent for whites and 64 percent for Asians).

Differences also exist in terms of the academic rank of doctoral women scientists and engineers within racial groups. In 1987, relatively more white (18 percent) than Asian (17 percent) or black (13 percent) women held full professorships. Blacks were relatively more likely to be at the assistant professor level (39 percent, compared to 29 percent of whites and 23 percent of Asians).

Labor Market Indicators[23]

The labor force participation rates of women scientists and engineers vary only slightly among the racial groups. In 1986, participation rates ranged from a low of 93 percent for Asian women to a high of 97 percent for native Americans.

Although variation among racial groups was not large, whites earned the highest average annual salaries among women scientists and engineers. In 1986, white women scientists averaged $29,400, compared to Asian women scientists who reported salaries of $28,800 and blacks who averaged $25,400. Among engineers, Asian women earned the highest annual salary—an average of $35,000 in 1986. Comparable salaries for white women engineers and black women engineers were $34,300 and $32,900, respectively.

At the doctoral level, Asian women again had the highest average salary ($41,800) in 1987. White Ph.D. women averaged $40,200 and blacks $38,800. Native Americans had the lowest average salary ($32,700).

Regardless of racial group, all women scientists and engineers reported annual salaries lower than those for men. For example, in 1986, Asian women earned 74 percent of men's salaries; the ratios for black women and white women were, respectively, 78 percent and 76 percent of black and white men's salaries.

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[22] U.S. Bureau of the Census, *Detailed Occupation and Years of School Completed by Age for the Civilian Labor Force by Sex, Race, and Spanish Origin: 1980*, Supplementary Report #PC 80-S1-8, 1980 Census of the Population (Washington, DC: U.S. Government Printing Office, 1983), p. 7.

[23] Because of small sample sizes for women scientists and engineers by racial/ethnic group, data on unemployment and underemployment are not reliable and, therefore, are not presented.

Among Ph.D. scientists, differences between women's and men's salaries were not as large. For blacks, the ratio of women's salaries to men's was 87 percent in 1987. It was 82 percent for Asians and 79 percent for whites.

Hispanics

Hispanics comprise a diverse ethnic group and include individuals of Spanish heritage from Central or South America, Asia, or Europe. Among Hispanic women scientists and engineers, about 23 percent (4,600) were Mexican American, 30 percent (5,800) were Puerto Rican, and 45 percent (8,900) were classified as "other Hispanic" in 1986; the remainder (300) did not report their Hispanic origins. It would be desirable to differentiate among the various Hispanic groups, because each may face differing experiences in the S/E workforce. Due to data limitations, however, Hispanics are treated in the aggregate.

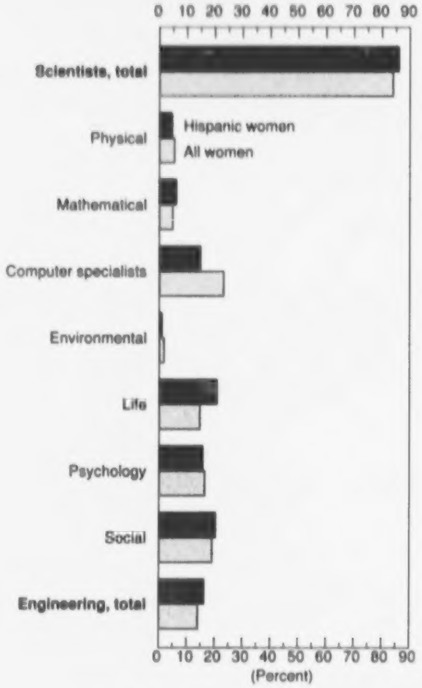
Employment Levels and Trends

Almost 3 percent (19,600) of women scientists and engineers in 1986 were Hispanic, compared to about 2 percent of men. The proportion for women was up from 2 percent (9,500) in 1982 (the earliest year for which comparable data are available). Among doctoral women scientists and engineers, Hispanics accounted for 1.8 percent (approximately 1,200) of those employed in 1987. Female Hispanic representation in the overall U.S. workforce was about twice their representation in science and engineering—6 percent versus 3 percent.[24]

Field

In general, the S/E field distributions of Hispanics and all women are fairly similar (figure 1-9). However, Hispanics are relatively more likely to be life scientists (21 percent versus 15 percent) and relatively less likely to be computer specialists (15 percent versus 22 percent).

Figure 1-9. Field distribution of all employed Hispanic and all women scientists and engineers: 1986



SOURCE: Appendix B; based on table 2.

Experience

Hispanic women scientists and engineers have substantially fewer years of professional work experience than do all women. In 1986, almost 75 percent of Hispanics—compared to about 59 percent of all women—had less than 10 years' experience.

Career Patterns

Hispanic women scientists and engineers are about as likely as all women to report management as their primary work activity. Among academically employed doctoral scientists and engineers, relatively few Hispanics held the rank of full professor (11 percent, compared to 18 percent of all women). The proportion of Hispanic women who were associate professors was about the same as for all women: 22 percent versus 25 percent.

Labor Market Indicators

Hispanic women scientists and engineers are slightly less likely than all women to be in the labor force. In 1986, the Hispanic labor force participation rate was 92 percent, compared to a total of 94 percent.

Hispanic women reported an average annual salary substantially lower than that of all women scientists and engineers: $25,200 versus $29,900. Further, the ratio of Hispanic women's salaries to Hispanic men's was 69 percent, compared to 75 percent for female and male scientists and engineers overall. Among doctoral scientists and engineers, Hispanic women reported median salaries slightly below that of all women in 1987: $37,300 and $40,200, respectively.

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[24] *Employment and Earnings*, Vol. 34, No. 1, p. 205.

chapter 2

education of women in science and engineering

OVERVIEW

One major factor contributing to women's underrepresentation in the science and engineering (S/E) workforce is that they do not participate in science and mathematics to the same extent as men at any educational level. Differences in participation—and interest—in mathematics and science first arise at the elementary and middle school levels. For example, results of mathematics skill assessments indicate that female performance starts to lag behind that of males among 13-year-olds (middle school). On science assessments, results show females scoring lower than males as early as age 9 (elementary school).

By high school, data show that females are much less likely than males to participate in mathematics and science education. Females take fewer years of mathematics and science coursework; they are also less likely to take advanced coursework in these subjects. These data, taken together with differences on mathematics and science skill assessments, indicate that not only are potential leakages in the S/E education pipeline greater for females than for males, but that the leakages for females occur very early in their precollege experiences.

Lower participation in mathematics and science coursework and lower levels of performance on skill assessments in these subjects are partially reflected in lower scores of females on examinations measuring mathematics and science achievement. For example, in 1988, female scores on the mathematics component of the Scholastic Aptitude Test (SAT) were 43 points lower than males'. Lower proportions of females than males also scored in the highest range on this exam: while 5 percent of females scored over 650, 13 percent of males did so in 1988.

Precollege mathematics and science experiences help determine participation in S/E education at the undergraduate and graduate levels. Traditionally, women have not participated in science and engineering education at these levels to the same extent as have men. Some progress has been made, however. The number of S/E bachelor's degrees awarded to women increased sharply between 1976 and 1986, up 29 percent compared with a 2-percent increase for men. The largest percentage increases for women have occurred in two fields: computer science and engineering. In recent years, however, growth in these fields has begun to taper off.

Progress is also apparent at the graduate level. Enrollment of women in S/E graduate programs jumped 29 percent between 1980 and 1988, compared to a 10-percent increase for men. In addition, although women still tend to be concentrated in graduate programs in psychology and the social or life sciences, their numbers have doubled in engineering and computer science since 1980.

Finally, women are also applying for—and receiving—Federal assistance for graduate study in greater numbers. Over 2,000 women applied for National Science Foundation (NSF) Graduate Fellowship awards in science and engineering in 1988, accounting for almost two-fifths of the applicants. In 1975, their share of applications was less than one-third.

PRECOLLEGE PREPARATION

Mathematics and Science Achievement

This section examines cognitive differences in mathematics and science achievement exhibited by females and males at three precollege levels: elementary, middle, and secondary. It is based on results from mathematics and science assessments administered by the National Assessment of Educational Progress (NAEP), part of the Educational Testing Service. Since the late sixties, NAEP has conducted surveys of student proficiencies in several content areas for national samples of students at the 9-, 13-, and 17-year-old age levels. The objective of these assessments is to determine how specific groups of U.S. students respond to exercises in different academic areas; it is not intended to measure the performance of individual students. Achievement is assessed on a common scale of 0 to 500.

Mathematics

Proficiency in this subject area is measured at five levels on a 500-point scale:

- Level 150 indicates proficiency with simple arithmetic facts,
- Level 200 shows beginning skills and understanding,
- Scores above level 250 show an understanding of basic operations and beginning problem-solving ability,
- Level 300 indicates proficiency in terms of moderately complex procedures and reasoning, and

- Scores above level 350 show that students have a mastery of both multi-step problem solving and algebra.[1]

Nine-Year-Olds. Between 1978 and 1986, overall mean scores on the mathematics assessment edged upward for both females and males; progress by males was greater, however. In 1986, mean scores for both females and males were 221.7, up from 219.9 for females and 217.4 for males[2] in 1978.

Levels of proficiency for females and males at this age level are remarkably similar. In 1986, virtually all students (98 percent) scored above 150, indicating a mastery of simple arithmetic facts. Furthermore, 21 percent of both female and male 9-year-olds scored 250 or more, showing they have a basic understanding of simple operations and problem-solving skills.

Thirteen-Year-Olds. The progress of females at this age level begins to lag behind that of males. In 1986, overall means for females and males were 268.0 and 270.0, respectively. Since 1978, however, scores for males have shown a statistically significant (at the 0.05 level) increase from 263.6. Means for females also showed an increase from 264.7, but this change was not statistically significant.

Within this age group, differences begin to emerge at each of the proficiency levels. For instance, almost 72 percent of females, but 74 percent of males, scored above level 250 (basic understanding). The proportions scoring at or above the next highest level, 300—moderately complex procedures and reasoning—were 14 percent (female) and 18 percent (male).

Seventeen-Year-Olds. The largest difference in mean scores occurs at this age level: the mean for females in 1986 was more than 5 points lower than for males (299.4 versus 304.7). Since 1978, changes in scores have not been significant for either group.

Smaller percentages of females than males score above each proficiency level. For example, 48 percent of females compared to more than 54 percent of males scored over 300 (moderately complex procedures and reasoning). A smaller percent- age of females also scored above level 350 (multi-problem solving and algebra): 5 percent versus 8 percent.

Science

For this subject, the five proficiency levels are defined as follows:

- Level 150 shows knowledge of everyday science facts,
- Level 200 indicates an understanding of simple scientific principles,
- Above level 250, there is an ability to apply basic scientific information,
- Scores over level 300 illustrate skills in analyzing scientific procedures and data, and
- Level 350 shows that students can integrate specialized scientific information.[3]

Nine-Year-Olds. A lag in the performance of females, combined with significant changes in the performance of males over the last several years, has opened a large gap between female-male scores. In 1986, overall means for females and males were 221.3 and 227.3, respectively. In 1978, however, the score difference was less than 5 points: 217.7 for females versus 222.1 for males.

Differences in proficiency are evident among female and male 9-year-olds. Whereas only about 70 percent of females scored over 200 (understanding of simple principles), 73 percent of males did so. The proportions showing an ability to apply basic information (level 250) were 26 percent for females and 29 percent for males.

Thirteen-Year-Olds. In this age group, too, females have made less progress in science than have males. The overall mean for females in 1986 (246.9) was more than 9 points lower than for males (256.1). In 1978, the difference was about 7 points.

Levels of scientific proficiency for females also show lagging performance. About 48 percent of female 13-year-olds, but 58 percent of males, scored above 250 (application of basic knowledge) on the most recent assessment. Likewise, the percentages who scored over 300 (ability to analyze procedures and data) were lower for females: 6 percent versus 13 percent.

Seventeen-Year-Olds. The biggest difference in means was found for this age group. In 1986, the overall mean of 282.3 for females was almost 13 percentage points lower than that for males—294.9. There has been little change in scores for either gender since the late seventies.

Females and males record substantial differences in proficiency levels at this age. For example, the proportions scoring above 300 (analysis of procedures and data) were 34 percent for females and 49 percent for males. The shares scoring at or greater than the highest level, 350 (integration of specialized knowledge), were 5 percent and 10 percent, respectively.

Characteristics of College-Bound Seniors

College-bound seniors represent the largest potential pool of future scientists and engineers. Scores that these seniors achieve on the Scholastic Aptitude Test not only have substantial importance in terms of college admissions decisions, but also allow further insight into the precollege experiences of women and minorities compared to men and the majority.

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[1] For a more detailed discussion of the mathematics assessment and levels of proficiency, see Educational Testing Service, *The Mathematics Report Card: Are We Measuring Up?, Trends and Achievement Based on the 1986 National Assessment*, Report No. 17-M-01 (Princeton: Educational Testing Service, 1988).

[2] The change in scores for males between 1978 and 1986 was statistically significant at the 0.05 level.

[3] For a more detailed discussion of the science assessment, see Educational Testing Service, *The Science Report Card: Elements of Risk and Recovery, Trends and Achievement Based on the 1986 National Assessment*, Report No. 17-S-01 (Princeton: Educational Testing Service, 1988).

Data collected on college-bound seniors by the Admissions Testing Program of the College Entrance Examination Board provide a comprehensive and robust source of material on this population. This section examines several aspects of these data:

- Coursework in high school,
- Scores on the SAT,
- Scores on the SAT Achievement Test series,
- Scores on Advanced Placement (AP) examinations, and
- Undergraduate plans of college-bound seniors.

Coursework

The most current data on number of years and type of science and mathematics courses taken in high school are for college-bound seniors. This population consists of individuals who take the SAT and complete its Student Descriptive Questionnaire.

In 1988, females reported completing an average of 3.6 years of mathematics coursework; the average for males was 3.8 years. Although the number of years of study does not differ substantially, females tend to take less advanced coursework in this subject than do males. For example, over 90 percent of both females and males reported taking a geometry course, but smaller percentages of females reported taking trigonometry (52 percent versus 59 percent) or calculus (15 percent versus 21 percent). Additionally, females were less often in honors courses than males: 21 percent compared to 24 percent.

The data also show that females have slightly fewer years of study in natural science than do males: in 1988, these averages were 3.1 years and 3.3 years, respectively. As in math, coursework composition varies by gender. Whereas almost all females and males take biology, females were much less likely to take physics: 35 percent compared to 51 percent of males. The percentage who reported honors courses was also a little lower for females (19 percent) than males (21 percent).

There were less differences by gender for social science/history courses. In terms of coursework in these subjects, females and males each took about 3.3 years. More females than males reported taking psychology or sociology classes; about the same proportions of females and males—slightly less than half—had taken economics in high school.

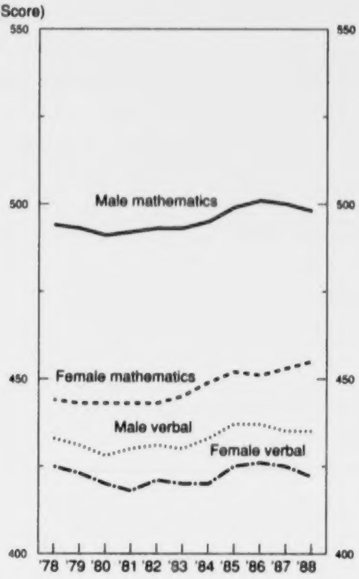
Scholastic Aptitude Test Scores[4]

In 1988, females continued to score somewhat lower than males on the verbal component and substantially lower on the mathematics portion of the Scholastic Aptitude Test (figure 2-1). Although there has been some fluctuation over the decade, score differences between females and males have increased on the verbal section but narrowed on mathematics since 1978.

Between 1978 and 1988, verbal scores for females fell from 425 to 422; concurrently, males increased their verbal scores from 433 to 435. The overall trends for both females and males have been similar, however: scores declined until the early eighties and then rose sharply until the mid-eighties. Over the last 2-year period, scores have again shown a decline.

The percentile ranking on the verbal component varies little between females and males. In 1988, roughly 3 percent of

Figure 2-1. SAT scores, by gender: 1978-88



Note: Score range is 200 to 800 for each component.

SOURCE: Appendix B; table 31.

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[4] The Admissions Testing Program of the College Entrance Examination Board offers the Scholastic Aptitude Test to college-bound seniors. The examination consists of two components. The verbal component tests reading comprehension and vocabulary skills, and the mathematics component assesses problem-solving ability using arithmetic reasoning and basic algebra and geometry skills. The score range is 200 to 800 for each component.

females—compared to 4 percent of males—scored in the 650 to 800 range. Rankings for both genders were also similar at lower score ranges. The fractions who scored between 400 and 499 were 33 percent (females) and 34 percent (males).

On the mathematics component, scores over the 10-year period rose 11 points for females (444 to 455); the net increase for males was 4 points (494 to 498). The 10-year trend in scores for each gender also differed. For females, scores remained constant until 1982 and then began a steady increase. For males, a slight decline was followed first by a period of stability and then by one of increase. In the last 2 years, however, scores for males have fallen.

Females are much less likely than males to score in the 650 to 800 range on the mathematics component. In 1988, only 5 percent of females, but about 13 percent of males, scored in this range. This difference has increased: in 1981, these fractions were 4 percent for females and 10 percent for males. Furthermore, females were more likely than males to score in the 400 to 499 range in 1988 (31 percent versus 27 percent).

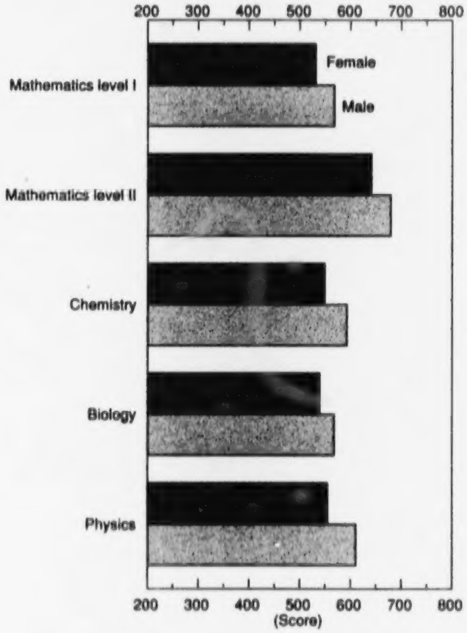
Achievement Test Scores[5]

College-bound females are less likely to take achievement tests in science and mathematics[6] than are all college-bound seniors. In 1988, females accounted for 46 percent of test-takers who took one or more achievement exams in a science or mathematics field; they also comprised 52 percent of college-bound seniors who took the SAT and 54 percent of seniors who took one or more achievement exams in a non-science or -mathematics field. Among science and mathematics test-takers, the range in female participation was about one-fifth of the physics students to roughly one-half of those in biology and mathematics level I.

Scores on science and mathematics achievement tests have been consistently lower for females than for males throughout the eighties. In 1988, score differences ranged from 29 points on the biology test to 56 points on the physics exam (figure 2-2). These differences have remained fairly constant during the eighties, with the single exception of the biology test: here, a 40-point difference in 1981 had narrowed to 29 points by 1988.

The SAT mathematics scores for those who took one or more science or mathematics achievement tests are also lower for females than males. In 1988, the difference in mathematics scores for those who took the mathematics level I test was 46 points (594 versus 548). The narrowest gap (28 points) was for those who took the physics exam (668 versus 640).

Figure 2-2. Science and mathematics achievement test scores, by gender: 1988



Note: Score range is 200 to 800 for each test.

SOURCE: Appendix B; table 33.

Advanced Placement Examinations Scores[7]

Similar to the pattern among achievement test-takers, females account for a smaller share of AP science and mathematics test-takers. Their proportion, however, has increased rapidly over the past 15 years. By 1988, females represented about 38 percent of science and 34 percent of mathematics/computer science participants, up from 25 percent of each in 1973.[8] The overall proportion of AP test-takers accounted for by females rose from 41 percent to 48 percent during the same period.

Representation of females differs significantly by AP test topics. Among science fields, females accounted for roughly 51 percent of biology candidates, but only 16 percent of those who took the physics C-electricity/magnetism test[9] (figure 2-3). Among candidates in the mathematics/computer science fields, female representation ranged from about 41 percent of mathematics/calculus AB[10] test-takers to 14 percent of the computer science AB[11] test-takers.

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[5] In addition to the SAT, the Admissions Testing Program offers an achievement test series to college-bound seniors. The series includes 1-hour multiple choice exams in 14 academic areas. About one in five of those students who take the SAT also take one or more of the achievement tests. The score range is 200 to 800 for each test.

[6] Of the 14 academic subjects in which achievement tests were administered in 1988, 5 were in science and mathematics fields: mathematics level I, mathematics level II, biology, chemistry, and physics.

[7] The College Entrance Examination Board also administers the Advanced Placement Program. In this program, a series of exams are offered in 24 areas, 9 of which are in science and mathematics/computer science. A student who does well on one or more of these exams may be granted college credit or appropriate placement by participating higher education institutions. The AP grading scale ranges from 1 (no recommendation for credit) to 5 (extremely well qualified in the subject area). About 288,400 students participated in this program in 1988.

[8] Advanced Placement Program, The College Board, *AP Yearbook 1988* (New York: The College Entrance Examination Board, 1988), p. 5.

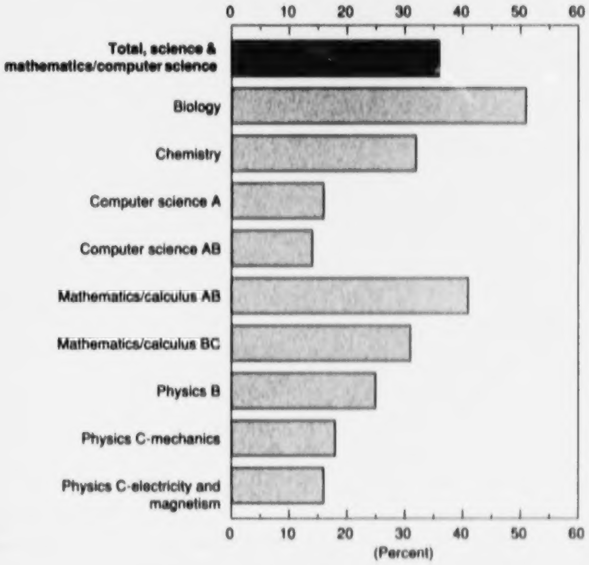
Females continued to score lower than males on the science and mathematics/computer science examinations in 1988 (table 2-1). While scores for females were generally in the 2- (possibly qualified) to 3-point (qualified) range for each of the exams, scores for males were around the 3-point mark or higher. Only on the mathematics/calculus BC exam did females score in the fully qualified range (3.30 versus 3.63 for males). The trends in AP scores on these tests have been the same for females and males for the last several years. Since 1984, scores have either dropped slightly or remained about the same; this trend was true in all fields except mathematics/calculus BC, where scores have risen.

Table 2-1. AP examination scores for female and male test-takers: 1988

Exam	Female	Male
Biology	2.87	3.23
Chemistry	2.64	3.09
Physics B	2.50	2.96
Physics C-mechanics	2.70	3.42
Physics C-electricity and magnetism	2.86	3.37
Mathematics/calculus AB	2.95	3.21
Mathematics/calculus BC	3.30	3.63
Computer science AB	2.01	2.65
Computer science A	2.24	2.99

SOURCE: Appendix B; table 34.

Figure 2-3. Representation of female students who took science and mathematics AP tests: 1988



SOURCE: Advanced Placement Program, The College Board, National Summary Report, 1988, (New York: The College Entrance Examination Board, 1988), pp. 3-5.

Intended Undergraduate Major[12]

The probability of choosing a science major is slightly higher for females than males, but males are significantly more likely to choose engineering than females. In 1988, roughly 23 percent of females—compared to 21 percent of males—intended to major in a science field. Both of these proportions have been declining since 1983, however, when about 27 percent of females and 30 percent of males planned a science major. The decline results from a sharp decrease in interest in computer science programs. At its peak in 1983, about 9 percent of females and 12 percent of males chose computer science as their undergraduate field. By 1988, these percentages had fallen to 2 percent and 4 percent, respectively. Within science fields, there are substantial differences between females and males (figure 2-4). For example, females are more heavily concentrated in the social sciences than males.

Also in 1988, only 3 percent of females, but almost 18 percent of males, intended to major in engineering. During the eighties, the propensity to choose engineering declined for males but remained relatively constant for females.

SAT mathematics scores for college-bound seniors who plan to major in a science or engineering field are lower for females than males. These scores varied widely, however, by major. For example, the score range for females was 418 (computer science) to 577 (mathematics); for males, it was

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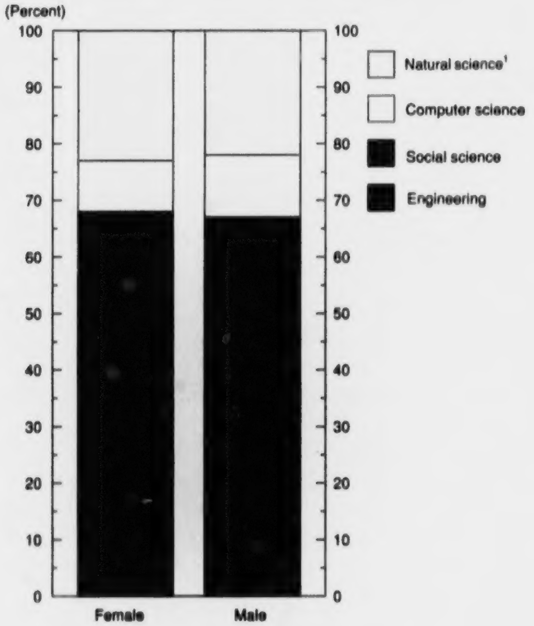
[9] The physics C-electricity/magnetism AP exam and the physics C-mechanics exam allow a student the opportunity to earn placement or credit in only one of these respective areas of physics. In contrast, the physics B exam covers all aspects of physics, and a student who scores well on this exam may earn as much as a semester's course credit in this field.

[10] Two AP exams are offered in mathematics/calculus. The calculus AB exam is not as rigorous as the calculus BC exam. While up to a full year of college credit may be earned by those who score well on the BC test, scores on the AB test are used primarily for placing students in courses appropriately.

[11] In 1988, the examination for computer science placement was divided into two separate tests. The computer science A exam concentrates on programming methodology and procedural abstraction. The computer science AB exam includes all questions on the "A" test but contains more in-depth material on algorithms, data structures, and data abstraction.

[12] The intended undergraduate major of college-bound seniors is determined by answers to questions on the Student Descriptive Questionnaire. This questionnaire is distributed to all college-bound seniors as part of the SAT application package. The questions ask students to choose their first choice of college curriculum from a list of 22 major categories, of which 6 are in science and 1 is in engineering.

Figure 2-4. Intended undergraduate major, by S/E field and gender: 1988



[1]Includes physical sciences, mathematics, biology, and agriculture.

SOURCE: Appendix B; based on table 35.

444 (agriculture) to 613 (mathematics). Math scores overall were 455 and 498 for females and males, respectively.

UNDERGRADUATE EDUCATION

Characteristics of American Freshmen

Data on freshmen are collected annually by the Cooperative Institutional Research Program at the University of California, Los Angeles.[13] They reflect responses from a national sample of American freshmen at 4-year colleges and universities.[14]

Grade Point Average

Most recent grade point average (GPA) data indicate that students who intend to major in science and engineering fields are more academically prepared than students in other programs; this statement is true regardless of gender. For example, about two-fifths of both females and males in these majors reported a high school GPA in the "A" range in 1987. Overall, these proportions were 31 percent for females and 26 percent for males.

Assessing GPA data by field reveals some variations between genders and wide variations among S/E fields. With the exception of social science majors, a larger fraction of females than males report an "A" average. Among science fields, the percentage of females reporting this grade ranged from 30 percent of social science majors to over 60 percent of either mathematics and physical science majors. For males, the range was 25 percent (computer science) to 51 percent (mathematics). For probable engineering students, 61 percent of females and 43 percent of males reported an "A" average in high school.

Degree Aspirations

Among 1987 S/E freshmen, the highest fraction of both females and males indicated a master's degree as their highest degree planned: 35 percent and 39 percent, respectively. Females planned to study for a doctorate, medical, or law degree to a greater extent than males. For example, 26 percent of females compared to 22 percent of males planned studies to a Ph.D.

Level of Parents' Education

Females and males who are prospective science and engineering majors report similar education credentials for their parents. About 49 percent of females and 51 percent of males indicated that their fathers had either a baccalaureate or a graduate degree. Among their mothers, these proportions were 36 percent for both genders.

Annual Parental Income

Estimates of their parents' income is also very similar for both females and males who intend to major in an S/E field. For example, 41 percent of females—and 43 percent of males—reported their parents' annual income above the $50,000 mark. For the lower income brackets, 16 percent of females and 13 percent of males placed their parents' income at less than $20,000 per year.

Plans for Financial Aid

A large share of both female and male freshmen expressed "some" concern about financing their education. Among 1987 probable S/E students, this proportion was higher for females (52 percent) than males (47 percent). Females also considered money for college a "major" concern to a greater extent than males: 16 percent versus 11 percent.

Two types of financial support were listed as sources by one out of every two female and male S/E students: relatives and savings. Another source that was cited by equal proportions of both was grants or scholarships (27 percent).

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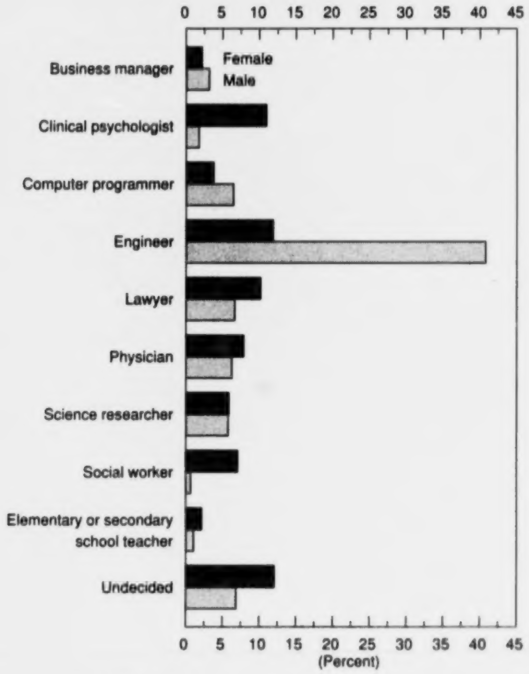
[13] The Graduate School of Education at UCLA and the American Council of Education jointly sponsor the Cooperative Institutional Research Program. The program was introduced in 1966 as a continuing longitudinal study of the American higher educational system. One of the cornerstones of the program is the American Freshmen Norm Survey.

[14] Data on American freshmen are from unpublished tabulations.

Probable Career

Whereas socioeconomic characteristics of female and male freshmen who are prospective science and engineering students do not differ substantially, the probable careers chosen by these students do (figure 2-5). The differences were particularly noticeable among students planning careers in clinical psychology, social work, and engineering. About 18 percent of females planned a career in clinical psychology or social work compared to less than 3 percent of males; in engineering, however, these proportions were 12 percent (females) and 41 percent (males). Among other fields, females more often choose the law profession (10 percent versus 7 percent), while males more often choose computer programming (7 percent versus 4 percent). Very few of either females or males (1 percent to 2 percent) planned an elementary or secondary teaching career.

Figure 2-5. Probable career choices of female and male freshmen majoring in S/E fields, by selected occupation: 1987



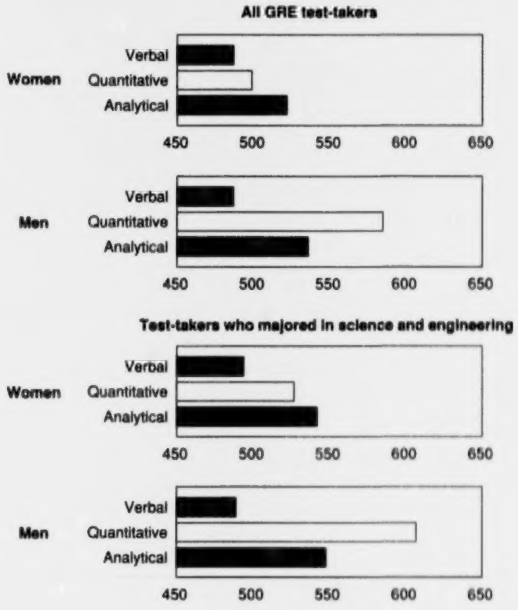
SOURCE: Appendix B; table 37.

Graduate Record Examination

The Educational Testing Service offers a series of tests—the Graduate Record Examination (GRE)[15]—to potential graduate students who plan further study in the arts and sciences. Primarily used by graduate and professional schools to supplement undergraduate records, GRE scores may also be used to examine undergraduate S/E preparation.

Although more women (111,900) than men (97,600) took the Graduate Record Examination in 1987,[16] women test-takers were much less likely than men to have majored in a science or engineering field at the undergraduate level (49 percent versus 72 percent).[17] Those test-takers who majored in S/E fields outscored all test-takers, regardless of gender, on every component of the exam (figure 2-6).

Figure 2-6. GRE scores, by undergraduate major and gender: 1987



Note: Score range is 200 to 800 for each component.

SOURCE: Appendix B; table 38 and unpublished data.

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[15] The GRE consists of a general aptitude test and advanced tests in 20 subject areas. The aptitude test is comprised of three components. The verbal component assesses the ability to use words in solving problems; the quantitative portion requires an ability to apply elementary mathematical skills and concepts to solve problems in quantitative settings; and the analytical component, a relatively new addition to the test (1979), measures deductive and inductive reasoning skills. The score range on the GRE is 200 to 800 for each component.

[16] Graduate Record Examination Board, *A Summary of Data Collected from Graduate Record Examination Test-Takers During 1986-87*, Data Summary Report #12 (Princeton: Educational Testing Service, 1988), p. 68.

[17] For purposes of this analysis, S/E fields include physical sciences, mathematical sciences, engineering, biological sciences, behavioral sciences, and social sciences.

In 1987, among those who majored in S/E fields, women generally scored slightly higher than did men on the verbal component, much lower on the quantitative section, and slightly lower on the analytical portion. These differences generally persisted across fields, although with wide variation (table 2-2). For example, women who majored in engineering scored higher than men on both the verbal and analytical sections by roughly 30 points and 40 points, respectively, but scored lower (12 points) on the quantitative component.

Between 1979 (the earliest year in which comparable data are available) and 1987, scores for both women and men who majored in S/E fields declined on the verbal component but rose on the other two components (appendix B; table 38). Some of the most dramatic increases occurred for women majoring in either biological science or engineering. On the quantitative component, scores for these women rose from 528 to 558 (biological science) and from 603 to 663 (engineering). The corresponding increases in analytical scores were from 526 to 563 and from 534 to 601, respectively. Scores for men in these fields rose also, but to a lesser extent.

Table 2-2. GRE scores for women and men test-takers, by undergraduate major: 1987

Component and field	Women	Men
Verbal		
Physical science	509	504
Mathematical science	474	488
Biological science	506	502
Behavioral science	504	513
Social science	456	461
Engineering	492	461
Quantitative		
Physical science	615	648
Mathematical science	635	670
Biological science	558	585
Behavioral science	494	539
Social science	454	511
Engineering	663	675
Analytical		
Physical science	580	568
Mathematical science	585	590
Biological science	563	551
Behavioral science	530	530
Social science	493	495
Engineering	601	557

Note: Score range is 200 to 800 for each component.
SOURCE: Appendix B; table 38.

Bachelor's Degree Production[18]

Almost 324,000 science and engineering bachelor's degrees were granted by U.S. institutions in 1986: more than 123,000 (38 percent) of these degrees were earned by women. A decade earlier, women earned 96,000—or 33 percent—of these degrees. By field, women were more highly represented in the sciences than in engineering (table 2-3), albeit with considerable variation among fields.

Women are more apt than men to earn degrees in the life and social sciences and psychology; men are more heavily concentrated in engineering fields. In 1986, more than two-thirds of women earned degrees in either the social sciences, psychology, or life sciences. In contrast, only 9 percent of women received degrees in engineering, mostly in the electrical, chemical, and mechanical fields. For men, one-third earned degrees in engineering, with the largest shares in electrical, mechanical, and civil specialties. Among science fields, the greatest proportions of men earned degrees in either social, life, or computer sciences.

Table 2-3. S/E bachelor's degrees granted to women, by field: 1988

Field	Number of women	Percentage of total
Total	123,057	38.0
Sciences, total	111,854	45.3
Physical	4,696	29.7
Mathematical	7,616	46.5
Computer	15,126	35.8
Environmental	1,354	22.3
Life	24,822	44.0
Psychology	28,246	69.0
Social	29,994	43.4
Engineering, total	11,203	14.5
Aeronautical/ astronautical	248	8.5
Chemical	1,469	24.7
Civil	1,146	13.1
Electrical	2,856	12.0
Industrial	1,281	30.1
Mechanical	1,677	10.3
Other	2,526	16.8

SOURCE: Appendix B; based on table 39.

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[18] Data for bachelor's degrees in science and engineering are from the U.S. Department of Education, National Center for Education Statistics' Annual Survey of Earned Degrees; these have been adapted to NSF field classifications.

Between 1976 and 1986, these patterns of S/E degree production changed markedly. Overall, the number of science and engineering baccalaureates earned by women has increased by 29 percent, compared to only a 2-percent increase for men. By field, the most notable gains for women have been in computer science—up twelvefold from 1,124 to 15,126—and engineering fields—up sixfold from 1,443 to 11,203.

Although women made gains in all fields in the last decade, the number earning degrees in some S/E fields is beginning to fall. For example, the number of degrees in the life and social sciences has been dropping gradually since the early eighties. In addition, although too early to indicate a trend, engineering degrees granted to women declined slightly for the first time between 1985 and 1986, dropping from 11,300 to 11,200. Within engineering, declines were registered in the chemical, civil, and mechanical subfields. These declines were tempered, however, by a substantial increase in electrical engineering degrees (2,400 to almost 2,900).

GRADUATE EDUCATION

The juncture between undergraduate and graduate education represents another critical point in the science and engineering pipeline. Because an advanced degree is considered an entry-level requirement in many science and engineering fields, students who terminate their formal education at the undergraduate level may be precluded from working in their field of study. To examine this crucial stage, the following section concentrates on several aspects of graduate education, including:

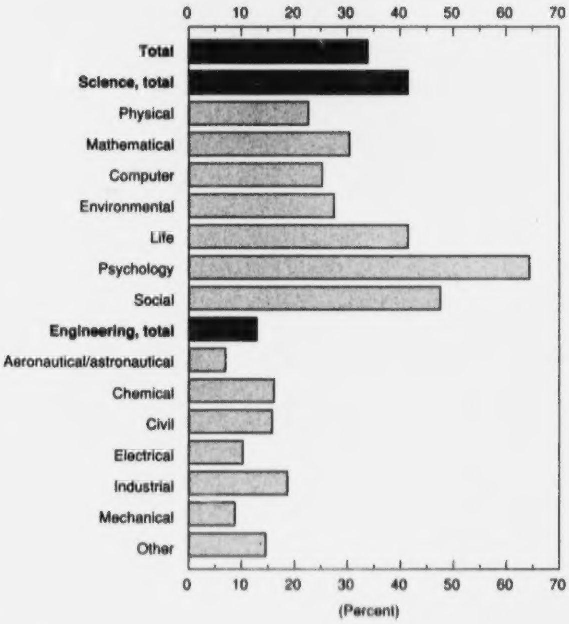
- Graduate enrollment in S/E programs,
- Graduate degree attainment rates in S/E fields,
- Advanced degree production in S/E fields,
- Sources of support for those pursuing S/E doctorates, and
- Characteristics of NSF fellowship recipients.

Graduate Enrollment[19]

In 1988, women represented one-third (34 percent) of graduate enrollment in science and engineering programs; in 1980 (the earliest year in which comparable data are available), this proportion was 30 percent. Representation of women varies considerably by field (figure 2-7). For example, within science fields, women accounted for about two-thirds of enrollment in psychology programs; within engineering, the largest fraction (less than one-fifth) was in industrial engineering.

Most women who were enrolled in graduate programs were in one of three fields in 1988: social sciences, psychology, or life sciences. Only about 10 percent were enrolled in engineering subfields, most often electrical, civil, and industrial engineering. Men, in contrast, were most highly concentrated (one-third) in engineering graduate programs, primarily in the electrical, civil, and mechanical subfields.

Figure 2-7. Women as a percentage of graduate enrollment, by S/E field: 1988



SOURCE: Appendix B; based on table 41.

Since 1980, there have been substantial changes in these distributions, resulting from very different growth rates over the 10-year period. Overall, graduate enrollment of women in S/E fields increased 29 percent between 1980 and 1988; this increase was significantly higher than the 10-percent growth experienced by men. For both women and men, the fastest growth was in computer science and engineering. Much slower growth rates occurred for women in the social and life sciences; for men, the number enrolled in graduate programs in these fields declined.

Graduate Degree Attainment Rates

An indicator of the progress made by women in earning advanced S/E degrees is the graduate degree attainment rate—i.e., a group's propensity to complete graduate degrees. At the master's degree level, this rate is defined as S/E master's degrees expressed as a percentage of the S/E bachelor's degrees awarded 2 years earlier. At the doctorate level, attainment is defined as the actual median elapsed time between baccalaureate and S/E doctorate, as reported by new doctorate recipients.[20]

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[19] Data presented in this section are from NSF's Survey of Graduate Science and Engineering Students and Postdoctorates. This survey has been conducted annually since 1966.

[20] Data on median elapsed time between baccalaureate and doctorate are from NSF's Survey of Earned Doctorates.

Master's Degree Attainment

The master's degree attainment rate over the 10-year period ending in 1986 rose slightly faster for women than for men. Nonetheless, the rate for women continues to be lower than that for men: in 1986, the rates were 16 percent versus 22 percent. The continued differential in attainment rates masks two very different trends in degree production for women and men. First, the rate for men has increased because baccalaureate production has slowed while master's degree production has risen very gradually. On the other hand, the rate for women has increased only marginally because degree production at both levels has been substantial with master's production outpacing that of baccalaureates.

Doctorate Attainment

At the doctorate level, median elapsed time between degrees is longer for women than men: 9.0 years versus 8.3 years in 1988. However, the number of years between bachelor's and doctoral degree attainment has increased over the decade for both women and men, rising from 7.8 years and 7.4 years, respectively. The reason for this overall increase in number of years is due to the increasing number of years reported to earn a degree in the sciences; elapsed time to engineering Ph.D. has not changed significantly. For example, since 1978, the time lapse between baccalaureate award and completion of a Ph.D. in psychology rose almost 3 years for both women (to 10.3 years) and men (to 9.9 years). For other science fields in 1988, the longest duration between degrees was in the social sciences (11.2 years for women and 10.3 years for men), while the shortest was in the physical sciences (6.5 years and 6.9 years, respectively). For engineering, on the other hand, median elapsed time to degree was shorter for women than men: 7.0 years versus 8.2 years.

Advanced Degree Production

Master's Degrees[21]

In 1986, women represented 31 percent (19,200) of the master's degrees conferred in science and engineering, up from 22 percent (12,100) a decade earlier (table 2-4). By field, women accounted for 41 percent of science degrees and 12 percent of those granted in engineering.

The field distribution of women who earn master's degrees parallels that exhibited at the bachelor's degree level. Women were most likely to earn their degrees in psychology (28 percent), the life sciences (19 percent), or the social sciences (15 percent). About 13 percent of women were granted engineering degrees; these were concentrated in the electrical, civil, and industrial subfields. In contrast, among men, almost 44 percent earned engineering degrees and 25 percent were granted degrees in either the life or computer sciences.

Table 2-4. S/E advanced degrees granted to women, by field

Field	Master's degrees		Doctorates	
	Number of women	Percentage of total	Number of women	Percentage of total
Total	19,182	30.7	5,382	26.6
Sciences, total	16,711	40.5	5,096	31.7
Physical	917	24.9	559	16.8
Mathematical	1,116	35.2	121	16.2
Computer	2,412	29.9	56	10.9
Environmental	517	23.1	144	19.8
Life	3,550	41.4	1,687	32.9
Psychology	5,426	64.9	1,675	54.8
Social	2,773	38.9	854	33.1
Engineering, total	2,471	11.6	286	6.8
Aeronautical/ Astronautical	43	6.9	9	6.0
Chemical	214	15.7	60	9.6
Civil	300	10.2	25	5.1
Electrical	556	10.0	38	4.3
Industrial	279	16.9	19	15.0
Mechanical	237	7.7	26	4.3
Other	842	13.7	109	8.4

Note: Master's degree data are for 1986; doctorate data are for 1988.
SOURCE: Appendix B; tables 44 and 46.

The growth rate for women earning S/E master's degrees far exceeded that for men over the decade: 59 percent versus less than 2 percent. As with bachelor's degrees, between 1976 and 1986, the fastest growing fields for women were computer science and engineering. The number of men earning degrees in these two fields was also substantial, but was masked by large declines in degree production among the remaining science fields. In the last 5 years (1981-86), growth in S/E master's degrees has slowed for women but has begun to increase for men: 28 percent and 9 percent, respectively.

Doctorates[22]

Trends in degree production at this level do not differ substantially from those at either the bachelor's or master's degree levels. The representation of women earning doctorates in science and engineering fields has increased dramatically, rising from 19 percent (3,300) in 1978 to 27 percent (5,400) in 1988. By field in 1988, women accounted for 32 percent of the Ph.D.s in science and 7 percent in engineering; comparable proportions in 1978 were 22 percent and 2 percent, respectively (table 2-4).

---

[21] Data for master's degrees in science and engineering are from the U.S. Department of Education, National Center for Education Statistics' Annual Survey of Earned Degrees; these have been adapted to NSF field classifications.

[22] Data on science and engineering doctorates granted in the United States are from NSF's Survey of Earned Doctorates.

About 62 percent of women earned their doctorates in either psychology or the life sciences in 1988. Only 5 percent earned engineering doctorates, most often in chemical and electrical specialties. The field distribution of men earning doctorates differs from this pattern: more than two-thirds had earned doctorates in either the life or physical sciences or engineering.

While the number of S/E doctorates granted to women increased 63 percent between 1978 and 1988, the number awarded to men rose by only 8 percent. For women, above average growth rates were experienced in engineering (up 440 percent to 286 degrees) and computer science (up 409 percent to 56 degrees). For men, computer science (316 percent to 458 degrees) showed the most significant growth over the decade. Overall for men, science degrees awarded between 1978 and 1988 dropped by 3 percent and engineering degrees rose 65 percent.

A different picture of S/E doctorate production emerges when viewing the data by citizenship. The slower overall growth among men between 1978 and 1988 largely results from declines in the number of male U.S. citizens earning these degrees (appendix B; table 47). In 1988, about three of every five male doctorate recipients was a U.S. citizen, down from three of four a decade earlier. Women exhibit a very different trend: the number of women earning S/E doctorates increased regardless of citizenship, although the number of women on temporary visas showed the most rapid growth. As such, the fraction of degrees awarded to women who were U.S. citizens had fallen to 76 percent in 1988, down from 84 percent in 1978.

Graduate Support Status[23]

For those who received a doctorate in a science or engineering field in 1988, both women and men reported universities as their primary source of support more often than any other source (figure 2-8). A smaller share of women than men reported this source, however: 43 percent versus 51 percent. Of nonacademic sources of funding, women (31 percent) were more likely than men (21 percent) to rely on personal or family resources.

Within the overall category of university support, there are numerous differences in actual type of support received. Among those receiving university assistance, 42 percent of women and 52 percent of men held research assistantships. The proportions holding teaching assistantships were 40 percent (women) and 37 percent (men).

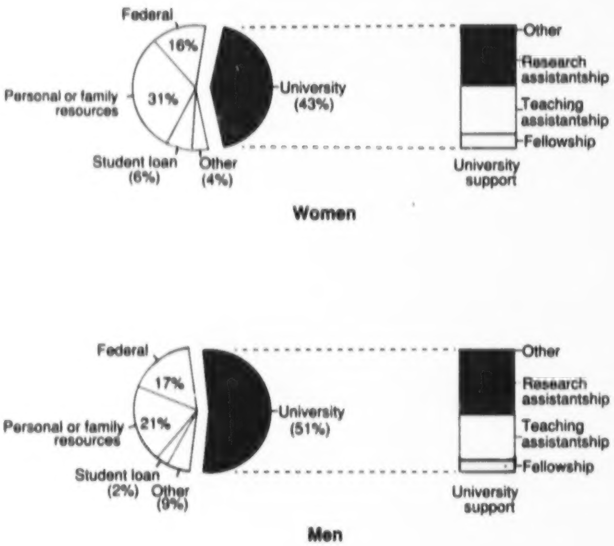
By field, differences between genders in types of university support reported are narrower (appendix B; table 48). For example, of those receiving degrees in the physical sciences, women (53 percent) were almost as likely as men (54 percent) to hold research assistantships. In comparison, roughly half of both women and men receiving social science or psychology degrees held teaching assistantships. In 1988, women who had received university support were more than twice as likely as men to have earned their S/E doctorates in either psychology or social science (34 percent versus 16 percent). Thus, general variations in type of support received may primarily reflect differences in field distributions.

Distributions in type of primary support for females and males change little if the focus is shifted to only those new S/E doctorate recipients with U.S. citizenship. Universities are also the major source of financing for these students. Of females, 39 percent were academically supported; about two-fifths of this support was in the form of research assistantships. Of males, about 46 percent were supported by academic institutions; about half of these held research assistantships.

National Science Foundation Fellowships[24]

Between 1975 and 1988, the representation of women in NSF's Graduate Fellowship Program rose substantially (appendix B; table 49). In fiscal year (FY) 1988, women accounted for 39 percent (2,006) of all fellowship applicants, up

Figure 2-8. Major sources of support for 1988 S/E doctorate recipients, by gender



SOURCE: Appendix B; based on table 48.

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[23] Data for this section are from unpublished tabulations from NSF's Survey of Earned Doctorates.

[24] Data on this topic are from NSF's Fellowship Program.

from 31 percent (1,778) in FY 1975. In terms of the number of new awards offered, their representation also increased, although remaining lower than their representation among applicants: 36 percent (245) in 1988, up from 27 percent (146) in 1975.

Fellowship application and award representation varies considerably by field. In FY 1988, women accounted for 25 percent of the applicants and 22 percent of the new awards in all engineering, mathematics, and physical science fields combined. However, they represented 54 percent of applicants and 52 percent of new awards in the behavioral and social science fields. In the life and medical sciences, the proportion of women applicants was 51 percent and their proportion of new awards was 53 percent.

POSTDOCTORAL APPOINTMENTS[25]

The number of women holding S/E postdoctoral appointments has risen along with the growth in the number of women earning science and engineering Ph.D.s. While doctoral degree production rose 63 percent in the last 10 years, the number of women holding postdoctorates increased 77 percent between 1977 and 1987. In 1987, about 3,600 postdoctoral appointments in science and engineering were held by women; this number represented 29 percent of all such appointments. In comparison, women accounted for 21 percent (2,000) of S/E postdoctorates in 1977.

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[25] Data for this section are from NSF's Survey of Doctorate Recipients.

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chapter 3

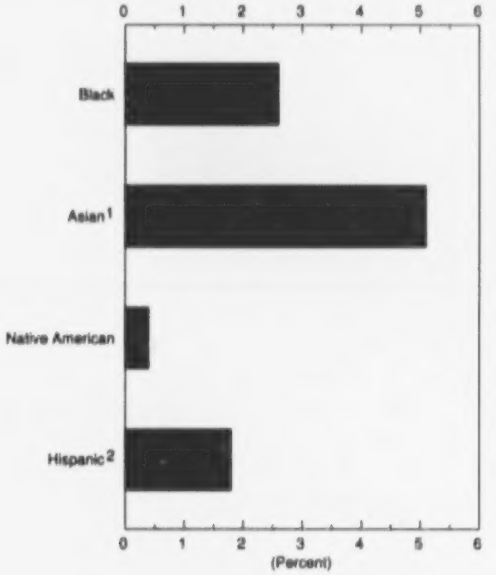
minorities in science and engineering

OVERVIEW

Based on their representation in the overall U.S. workforce, both blacks and Hispanics remain underrepresented in science and engineering (S/E). Asians are not underrepresented, and the proportion of native Americans among scientists and engineers is roughly equal to their representation in the total U.S. labor force.

The approximately 139,000 black scientists and engineers employed in 1988 represented 2.6 percent of all scientists and engineers, up from 1.8 percent in 1978 (figure 3-1). Blacks, however, accounted for 10 percent of total U.S. employment and almost 7 percent of all employed professional and related workers. Asians represented about 5 percent (268,000) of all scientists and engineers, but only about 2 percent of the U.S. labor force. There were about 22,000 native American scientists and engineers in 1988, accounting for less than 1 percent of total S/E employment; this number was roughly similar to their representation in the overall U.S. workforce. In 1988, about 1.8 percent (96,000) of all employed scientists and engineers were Hispanic; the Hispanic shares of all employed persons and those in professional and related occupations were 7 percent and 3 percent, respectively.

Figure 3-1. Minorities as a percentage of employed scientists and engineers: 1988



1 About one-quarter of Asian scientists and engineers were not U.S. citizens.
2 Includes members of all racial groups.

SOURCE: Appendix B; based on table 1.

Over the 1978-88 decade, employment of black scientists and engineers increased about twice as rapidly as did employment of whites: 192 percent (11 percent per year) versus 97 percent (7 percent per year). Employment of Asians rose by 146 percent (9 percent per year).

Racial/ethnic groups differ with respect to field distributions. The proportions in engineering ranged from about 56 percent of Asians to 32 percent of blacks; in contrast, about 52 percent of whites were engineers. In the sciences, blacks are more likely than others to be social scientists and psychologists, while Asians are least likely to be in these fields.

Asians—and, to a lesser extent, Hispanics—are less likely than other scientists and engineers to report management or administration as their primary work activity. For example, 22 percent of Asians and 26 percent of Hispanics cited management as their major activity in 1986.[1] Blacks and native Americans are just as likely as whites to hold management positions (roughly 28 percent).

On average, black and Hispanic scientists and engineers earn salaries below those earned by either whites or by all scientists and engineers combined. In contrast, Asians and native Americans report salaries equal to or greater than those for whites. Salaries for blacks averaged 81 percent of those for whites in 1986 (table 3-1). Hispanics earned 90 percent of the salaries paid across all racial/ethnic groups.

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[1] Because of a change in survey schedules, much of the data on the overall population of scientists and engineers cannot be updated. Therefore, with the exception of information on overall employment levels and field distributions, data on characteristics such as work activities and years of work experience are for 1986.

Minorities generally are more likely than majority scientists and engineers to be unemployed and underemployed (table 3-1). For example, unemployment among black scientists and engineers in 1986 averaged 3.8 percent; for whites and Asians, the unemployment rates were 1.5 percent and 1.8 percent, respectively. Almost 6 percent of blacks reported that they were underemployed, as did 2.5 percent of whites and 2.2 percent of Asians.

Table 3-1. Selected characteristics of scientists and engineers: 1986

Characteristic	White	Black	Asian	Native American	Hispanic[1]
Unemployment rate	1.5	3.8	1.8	1.2	2.1
S/E underemployment rate	2.5	5.5	2.2	2.4	4.8
Average annual salary	$38,700	$31,500	$39,100	$41,000	$34,600

[1] Includes members of all racial groups.
SOURCE: Appendix B; based on tables 22 and 25.

BLACKS IN SCIENCE AND ENGINEERING

Employment Levels and Trends

Blacks remain underrepresented in science and engineering despite significant employment gains over the past decade. Over the 1978-88 decade, employment of black scientists and engineers increased roughly twice as fast as employment of their white counterparts: 192 percent (11 percent per year) versus 97 percent (7 percent per year).

In 1988, the approximately 139,000 employed black scientists and engineers represented 2.6 percent of all employed scientists and engineers, up from 1.8 percent in 1978. Blacks in 1988 represented about 10 percent of total U.S. employment and 6.7 percent of those employed in professional and related occupations.[2]

Blacks also remain underrepresented in the doctoral science and engineering workforce. Over the 1977-87 decade, employment of black Ph.D.s increased by 135 percent (9 percent per year), while white employment rose by 44 percent (almost 4 percent per year). In 1987, about 6,400 (1.5 percent) of the doctoral S/E workforce was black, up from 2,700 (about 1 percent) in 1977.

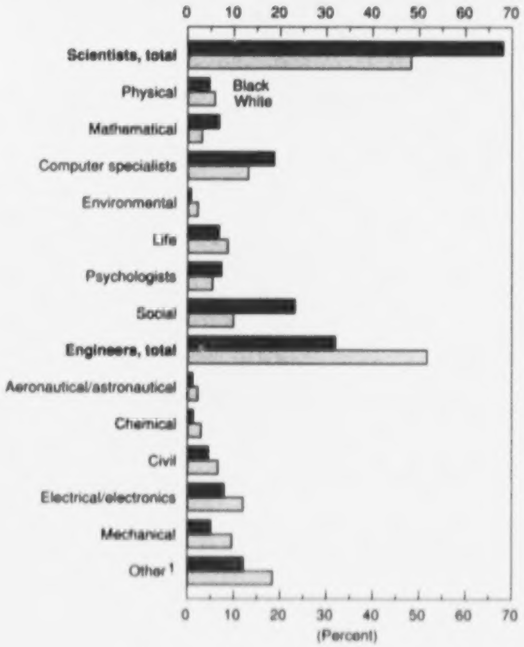
Among scientists and engineers at all degree levels, blacks were about twice as likely as whites to be non-U.S.citizens: 3 percent versus 1.5 percent. At the doctoral level, approximately 12 percent of blacks, and 3 percent of whites, were non-U.S. citizens.

Field

By field, the representation of blacks in 1988 ranged from roughly 6 percent of mathematical and social scientists to about 1 percent of environmental scientists. Among doctoral scientists and engineers, black representation ranged from 2.7 percent of social scientists to about 1 percent of physical and mathematical scientists.

Blacks remain more likely than whites to be scientists rather than engineers. In 1988, 68 percent of employed blacks were scientists, compared to 48 percent of whites. Within science fields, blacks were most likely to be social scientists or computer specialists[3] (figure 3-2). In fact, over the 1978-88 period, the most rapid employment gains for black scientists occurred

Figure 3-2. Field distribution of employed black and white scientists and engineers: 1988



[1] Includes industrial, materials, mining, nuclear, petroleum, and other.
SOURCE: Appendix B, based on table 1.

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[2] U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings*, Vol. 34, No. 1 (Washington, DC: U.S. Government Printing Office, January 1987), p. 179.

[3] Data collected in NSF surveys of science and engineering personnel define computer specialists as computer scientists, computer systems analysts, or "other" computer scientists. Computer engineers are classified as engineers. Computer programmers are not included in the classifications.

among computer specialists (up 23 percent per year) and social scientists (up about 16 percent annually). In comparison, annual employment growth of whites in these fields rose 14 percent and 10 percent, respectively.

An index of dissimilarity[4] can be used to summarize general field differences of various groups. The index between whites and blacks was 24 in 1988; that is, about 24 percent of blacks would have to change fields to have a distribution identical to that of whites.

Among doctoral scientists and engineers, a higher proportion of blacks (90 percent) than whites (86 percent) were scientists rather than engineers. Almost one-half of all blacks were either social scientists (28 percent) or psychologists (20 percent) in 1987. In contrast, 16 percent of whites were social scientists and 14 percent were psychologists. The index of dissimilarity between black and white doctoral scientists and engineers in 1987 was 19.

Experience

In general, blacks have fewer years' professional experience than do whites. Almost 40 percent of black scientists and engineers had fewer than 10 years of work experience, compared with about 29 percent of whites. Black scientists report fewer years of experience than do black engineers: about 42 percent of scientists, but only 30 percent of engineers, reported fewer than 10 years' experience in 1986. Among black social scientists, almost 60 percent had fewer than 10 years of experience; over half of these had less than 5 years.

Career Patterns

Both blacks and whites are about as likely to report management as their primary work activity. Roughly 28 percent of both racial groups were engaged in some aspect of management. There were, however, some differences between scientists and engineers. Among scientists, 30 percent of blacks and 25 percent of whites were in management; for engineers, the proportions were reversed: 26 percent of blacks and 31 percent of whites.

Black doctoral scientists and engineers employed in 4-year colleges and universities are less likely than their white colleagues to either hold tenure or be full professors. In 1987, 44 percent of blacks and 57 percent of whites held tenure. Roughly equal proportions of blacks and whites (about 8 percent) were in non-tenure-track positions. In 1987, only 26 percent of blacks—but 42 percent of whites—were full professors. In contrast, 34 percent of blacks and 24 percent of whites were associate professors.

Labor Market Indicators

Black scientists report different labor market experiences from whites. While blacks are slightly more likely than whites to be in the labor force, they are also more likely to be unemployed and underemployed.

Black scientists and engineers reported a labor force participation rate of 97 percent; for whites, this was 94 percent. The participation rate for black scientists and engineers was much higher than that for blacks in the overall population (64 percent)[5] or for black college graduates (87 percent).[6] The labor force participation rate for black scientists and engineers has remained relatively stable over the decade.

Once in the labor force, blacks are more likely than whites to be unemployed. Unemployment rates for black scientists and engineers averaged 3.8 percent in 1986; this was more than twice the 1.5-percent rate for whites. The unemployment rate for black scientists and engineers has, however, declined from 5.9 percent in 1976. The unemployment rate for black doctoral scientists and engineers was 2.0 percent in 1987 versus 1.0 percent for whites. In the overall U.S. workforce, the unemployment rate for blacks was 11.7 percent,[7] and black college graduates registered a 3.6-percent rate.[8]

By field, unemployment rates for black scientists and engineers ranged from 6.8 percent among social scientists to around 1 percent for mathematical and environmental scientists. Social scientists accounted for almost two-fifths of the total unemployment among black scientists and engineers.

Black scientists and engineers also experience higher rates of underemployment than do whites: 5.5 percent compared to 2.5 percent in 1986. This higher rate primarily results from the underemployment of blacks in science fields. Across these fields, black social scientists registered the highest rate (13 percent). On the other hand, underemployment among engineers averaged only 2 percent for blacks and 1 percent for whites.

Black scientists and engineers earned annual salaries that were about 81 percent of those for whites—a difference of $7,200. In 1986, salaries were $31,500 and $38,700, respectively. Annual salaries for blacks were lower than those for whites across all major S/E fields. The greatest difference occurred in the social sciences, where salaries for blacks ($22,800) were about 71 percent of those for whites. In contrast, salaries for black mathematical scientists averaged 93 percent of those for whites. The overall difference in annual salaries was smaller at the doctoral level. Black doctoral scientists and engineers earned average salaries of about $42,800 per year in 1987; this was approximately 86 percent (or $7,100 less) of those for white Ph.D. scientists and engineers.

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[4] U.S. Commission on Civil Rights, *Social Indicators of Equality for Minorities and Women* (Washington, DC: U.S. Government Printing Office, August 1978), p. 39. "The index . . . represents the percentage of a group who would have to change occupations in order for the group to have identical distributions of a comparison group. If two groups had the same distribution of occupations, the index of dissimilarity would be 0.0 . . ." (p. 44).

[5] *Employment and Earnings*, p. 160.

[6] U.S. Department of Labor, Bureau of Labor Statistics, unpublished tabulations.

[7] *Employment and Earnings*, p. 160.

[8] U.S. Department of Labor, Bureau of Labor Statistics, unpublished tabulations.

ASIANS IN SCIENCE AND ENGINEERING

Employment Levels and Trends

Since 1978, employment of Asian scientists and engineers has increased faster than has employment of whites: 146 percent (9 percent per year) versus 97 percent (7 percent per year). In 1988, the approximately 268,000 Asian scientists and engineers accounted for about 5 percent of the total S/E workforce. In contrast, Asians represent only about 2 percent of the overall U.S. workforce and only 3 percent of those in professional fields.[9]

Asian scientists and engineers were more likely than other racial groups to be non-U.S. citizens. About 27 percent of Asians, but only 1.5 percent of whites, did not hold U.S. citizenship.

Over the 1977-87 decade, employment gains by Asian doctoral scientists and engineers greatly outpaced those by whites. Employment of Asians rose 124 percent (8 percent per year) over the decade, while that of whites increased only about 44 percent (4 percent per year). In addition, Asian representation among doctoral scientists and engineers is higher than their representation among all scientists and engineers. In 1987, 8.7 percent (36,400) of employed doctoral scientists and engineers were Asian.

Among doctoral scientists and engineers, roughly 67 percent of Asians—compared to 97 percent of whites—were U.S. citizens. Of those who were U.S. citizens, about 15 percent of Asians, but 93 percent of whites, were native-born.

Field

Asians are somewhat more likely than whites to be engineers rather than scientists. About 56 percent of Asians and 52 percent of whites were engineers in 1988. Among scientists, Asians are most likely to be computer specialists and least likely to be environmental scientists (figure 3-3). The index of dissimilarity between Asians and whites was 16 in 1988; that is, 16 percent of Asians would have to change fields to have a distribution similar to that for whites.

Over the 1978-88 decade, employment of Asian scientists increased more rapidly than did that of Asian engineers: 12 percent versus 8 percent per year. For whites, employment of engineers rose at an annual rate of almost 6 percent, while that of scientists increased at a 9-percent rate. Among Asian scientists, the fastest growing fields were computer specialties—up about 19 percent per year to almost 50,000—and the mathematical sciences, up about 20 percent per year to 9,200.

The field distribution of Asian doctoral scientists and engineers differs from that of whites. Only 65 percent of Asians, but 86 percent of whites, were scientists rather than engineers in 1987. Of the Ph.D. Asian scientists, more than three-fifths were either life or physical scientists. Employment of Asian engineers increased over the 1977-87 decade more rapidly than did employment of scientists: 10 percent versus 8 percent annually. For whites, employment increases were more rapid among scientists. The index of dissimilarity between Asian and white doctoral scientists and engineers was 25 in 1987.

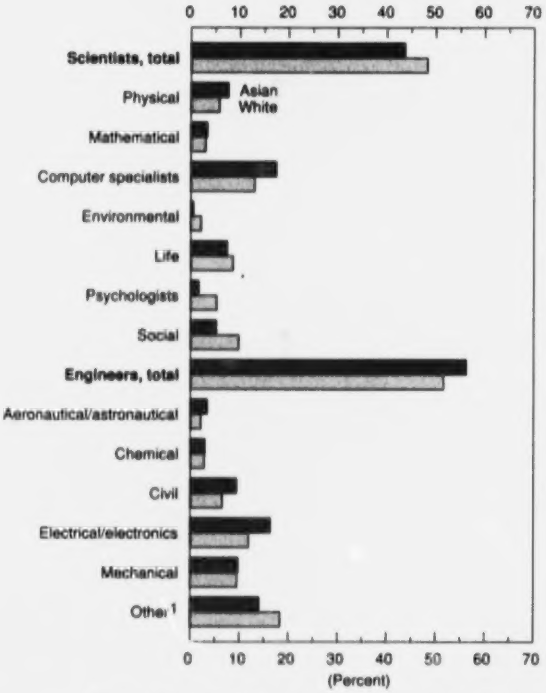
Experience

Both Asian and white scientists and engineers report a similar number of years of professional experience. For example, over 30 percent each of whites and Asians had fewer than 10 years' work experience. Among doctoral scientists and engineers, Asians had fewer years of experience, on average, than did whites. About 45 percent of Asian Ph.D.s in 1987 had fewer than 10 years of professional work; the comparable figure for whites was about 35 percent.

Career Patterns

Asians are less likely than whites to be in management. About 28 percent of whites—but only 22 percent of Asians—reported management as their major work activity.

Figure 3-3. Field distribution of employed Asian and white scientists and engineers: 1988



[1] Includes industrial, materials, mining, nuclear, petroleum, and other.

SOURCE: Appendix B; based on table 1.

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[9] U.S. Bureau of the Census, *General Social and Economic Characteristics, United States Summary*, 1980 Census of the Population (Washington, DC: U.S. Government Printing Office, 1983).

The tenure status and academic rank of Asian scientists and engineers also differ from those of whites. Among doctoral scientists and engineers in 4-year colleges and universities, Asians are less likely than whites to hold tenure: in 1987, roughly 43 percent of Asians, compared with 57 percent of whites, held tenure. A higher proportion of Asians (12 percent) than whites (9 percent) were in non-tenure-track positions.

Asians and whites also show some differences in measures of academic rank. In 1987, 36 percent of Asians and 42 percent of whites were full professors; at the associate level, the fraction was 22 percent for Asians and 24 percent for whites.

Labor Market Indicators

Labor market conditions are roughly the same for both Asian and white scientists and engineers. Asians are slightly more likely than whites to be in the labor force; however, they have a slightly higher unemployment rate.

The 96-percent labor force participation rate for Asians in 1986 was slightly above that for whites (94 percent). This rate for Asians, however, has fallen since 1976 when it was 99 percent. In the overall U.S. population, Asians had a labor force participation rate of roughly 70 percent.[10]

Unemployment among Asian scientists and engineers in 1986 was 1.8 percent; for whites, this rate was 1.5 percent, and for Asians in the general population, it was about 5 percent.[11] The unemployment rate for Asian scientists and engineers fluctuated over the 1976-86 decade: although it began the decade at much the same point as it ended it (1.5 percent in 1976), the rate peaked in 1982 to 3.3 percent before dropping to 2.4 percent in 1984. Among doctoral scientists and engineers, the unemployment rate for Asians in 1987 was roughly similar to that for whites—1.3 percent versus 1.0 percent.

Only 2.2 percent of Asian scientists and engineers were underemployed in 1986. The corresponding rate for whites was 2.5 percent. The S/E underemployment rate for Asians varied by field. For example, Asian scientists exhibited a rate of 3.5 percent; Asian engineers had a rate of 1.2 percent.

Asian and white scientists and engineers earned roughly similar salaries in 1986—$39,100 and $38,700, respectively. While both Asian and white engineers earned approximately similar salaries, among scientists, Asians' salaries averaged 103 percent of those for whites. Within the science fields, salary differences varied substantially. For example, Asian psychologists earned salaries averaging about 66 percent of those for whites, while salaries of Asian social scientists were 120 percent of those for whites. At the Ph.D. level, salaries for Asians and whites were essentially equal at $50,000 in 1987.

NATIVE AMERICANS IN SCIENCE AND ENGINEERING

Data for native Americans should be viewed with some caution since:

- Sample sizes for native Americans are very small; statistical reliability is thus lower for data on native Americans than for other groups.[12]
- Estimates for both scientists and engineers, and for the overall U.S. labor force, are based on self-reported data.

Employment Levels and Trends

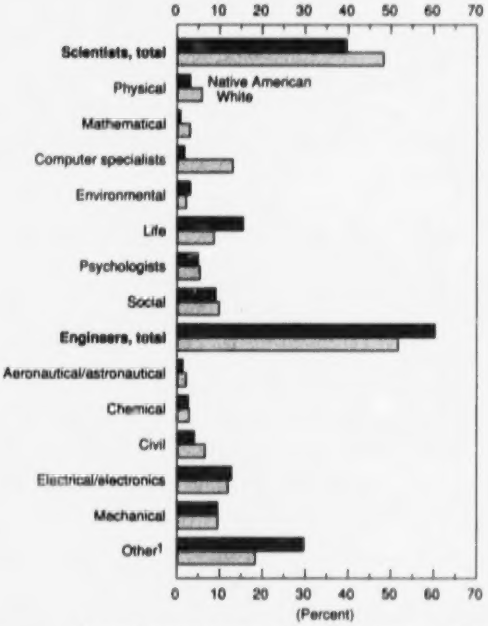
In 1988, the approximately 22,000 employed native American scientists and engineers represented less than 1 percent of the S/E workforce. This was similar to their representation both in the overall U.S. workforce and in professional and related fields.[13]

There are relatively few native Americans in the doctoral science and engineering workforce. In 1987, about 550 were native American, up from about 200 in 1977.

Field

There are certain differences in the field distribution of native Americans and whites (figure 3-4). For example, native

Figure 3-4. Field distribution of employed native American and white scientists and engineers: 1988



[1]Includes industrial, materials, mining, nuclear, petroleum, and other.

SOURCE: Appendix B; based on table 1.

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[10] Ibid.

[11] Ibid.

[12] See appendix A, "Technical Notes," for a discussion of the statistical reliability of the estimates of scientists and engineers.

[13] U.S. Bureau of the Census, op. cit.

Americans are somewhat more likely than whites to be engineers rather than scientists. In 1988, 60 percent of native Americans and 52 percent of whites were engineers. On the other hand, native American doctoral scientists and engineers were more highly concentrated in the sciences than in engineering in 1987: 93 percent versus 7 percent. This field distribution has changed somewhat since 1977, when almost all Ph.D. native Americans were scientists. Within the sciences in 1987, over half the Ph.D. native Americans were either life or social scientist

Experience

Native Americans, on average, report more years of professional experience than do whites. About 20 percent of native Americans—compared with 30 percent of whites—reported less than 10 years' work experience.

Career Patterns

Native Americans are about as likely as whites to report management as their primary work. In 1986, these proportions were 30 percent and 28 percent, respectively.

Among doctoral scientists and engineers employed in 4-year colleges and universities, native Americans were more likely (65 percent) than whites (57 percent) to hold tenure. Roughly 42 percent of both native Americans and whites were full professors in 1987, while 28 percent of the native Americans and 24 percent of the whites were at the associate professor level.

Labor Market Indicators

Native American scientists and engineers generally experience favorable labor market conditions. In 1986, they were more likely than whites to be in the labor force, and less likely to be unemployed or underemployed.

In 1986, native American scientists and engineers reported a labor force participation rate of 96 percent; for whites, the rate was 94 percent. Among those in the labor force, 1.2 percent of native Americans and 1.5 percent of whites were unemployed.

Data on annual salaries also reflect favorable labor market conditions for native Americans. In 1986, native American scientists and engineers had annual salaries of $41,000, compared to $38,700 for whites. At the doctoral level, salaries for native Americans in 1987 averaged $45,400; for whites, the average was $49,900.

HISPANICS IN SCIENCE AND ENGINEERING

Differentiating among Mexican Americans, Puerto Ricans, and other Hispanics is desirable since socioeconomic backgrounds and reasons for underrepresentation may vary among these groups. Because of data limitations, however, most of this discussion treats Hispanics in the aggregate.

In 1988, about 29 percent of employed Hispanic scientists and engineers were Mexican American and 12 percent were Puerto Rican. The remaining 53 percent were either "other Hispanic" or did not report their specific Hispanic origins.[14] In the total U.S. workforce, about 57 percent of Hispanics were Mexican Americans and 10 percent were Puerto Ricans.[15]

Employment Levels and Trends

Hispanics remain underrepresented in science and engineering. The approximately 96,000 employed Hispanic scientists and engineers in 1988 represented only 1.8 percent of all scientists and engineers. In comparison, roughly 7.2 percent of all employed persons in the United States were Hispanic in 1988, as were 3.4 percent of those in professional and related occupations.[16] About 11 percent of Hispanic scientists and engineers were non-U.S. citizens; the comparable figure for all scientists and engineers was about 3 percent. Among all Hispanics in the United States, about 20 percent were not U.S. citizens.

Hispanics are also underrepresented among doctoral scientists and engineers. In 1987, the 7,000 Hispanic Ph.D. scientists and engineers accounted for 1.7 percent of all doctoral scientists and engineers; their employment was up from 2,700 (0.9 percent) in 1977. Among Hispanic doctoral scientists and engineers, about 18 percent were not U.S. citizens in 1987; an additional 26 percent were foreign-born but held U.S. citizenship.

Field

There are relatively small differences between the field distributions of Hispanic and all scientists and engineers; the index of dissimilarity was only 11 in 1988. About 54 percent of Hispanics, and 51 percent of all scientists and engineers, were engineers in 1988. Among all scientists, Hispanics are somewhat more likely to be life scientists and less likely to be computer specialists (figure 3-5). Among doctorates, Hispanics were slightly more likely than all Ph.D.s to be scientists rather than engineers.

Experience

Hispanics report significantly fewer years of professional experience than do all scientists and engineers. About 44 percent of Hispanics reported fewer than 10 years' experience; the comparable figure for all scientists and engineers was 31 percent. Among Ph.D. scientists and engineers, a higher proportion of Hispanic than of all scientists and engineers had fewer than 10 years of work experience: 50 percent versus 36 percent in 1987.

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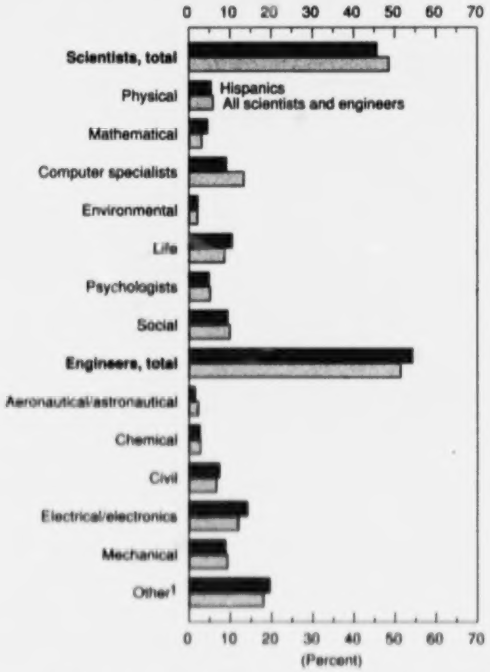
[14] The "other Hispanic" category includes individuals whose origins are in Spain or the Spanish-speaking countries of Central or South America. Also included in this category are those who identified themselves as Spanish, Spanish American, Hispano, Latino, etc.

[15] *Employment and Earnings*, p. 202.

[16] Ibid., p. 179.

Figure 3-5. Field distribution of employed Hispanic and all scientists and engineers: 1988



[1] Includes industrial, materials, mining, nuclear, petroleum, and other.

SOURCE: Appendix B; based on table 1.

Career Patterns

There is little difference in the proportions of Hispanic and all scientists and engineers who report management as their primary activity. In 1986, these fractions were 26 percent and 28 percent, respectively.

There are some notable differences within educational institutions between Hispanic and non-Hispanic doctoral scientists and engineers regarding tenure status and professional rank. In 1987, 45 percent of Hispanics and 56 percent of all scientists and engineers held tenure. Among Hispanics, about 28 percent were full professors; the comparable figure for all doctoral scientists and engineers was 41 percent.

Labor Market Indicators

Hispanic scientists and engineers face labor market conditions that differ somewhat from those for all scientists and engineers. While Hispanics are as likely as all scientists and engineers to be in the labor force, they are more likely to be unemployed and underemployed.

The labor force participation rate for both Hispanic and all scientists and engineers was 95 percent in 1986. The participation of Hispanic scientists and engineers in the labor force is well above the 65-percent rate for the overall Hispanic population;[17] it is also significantly higher than the 84-percent rate for Hispanic college graduates.[18]

The unemployment rate for Hispanic scientists and engineers (2.1 percent) in 1986 was greater than that for all scientists and engineers (1.5 percent). At the doctoral level, the unemployment rate for Hispanics was similar to that for all Ph.D. scientists and engineers: about 1 percent in 1987.

Hispanic scientists and engineers, on average, experience a higher degree of underemployment than do all scientists and engineers. The underemployment rate for Hispanics in 1986 was 4.8 percent, compared with 2.6 percent for all scientists and engineers. Hispanic scientists are much more likely to be underemployed than are Hispanic engineers: 8.2 percent versus 1.4 percent. Among scientists, relatively large numbers of Hispanic life scientists, social scientists, and psychologists were underemployed.

Salaries for Hispanic scientists and engineers averaged 90 percent of those earned by all scientists and engineers ($34,600 versus $38,400). The average salary for Hispanic engineers was 93 percent of that for all engineers; for scientists, the salary ratio was 86 percent. By science field, the differences ranged from 76 percent for psychologists to greater than 100 percent for physical and environmental scientists. Hispanic doctoral scientists and engineers earned approximately 95 percent of the salaries for all Ph.D. scientists and engineers ($47,200 versus $49,600) in 1987.

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[17] Ibid., p. 201.

[18] U.S. Department of Labor, Bureau of Labor Statistics, unpublished tabulations.

chapter 4

education of minorities in science and engineering

OVERVIEW

The educational experiences of minorities differ extensively from each other and from those of the majority. These differences show early on in the precollege experience. While blacks and Hispanics, for instance, tend to take less coursework in mathematics and science, Asians participate in these courses to a greater extent than the majority group. One indicator of this lower participation for blacks and Hispanics is scores on mathematics and science skills assessments. These groups scored lower than average as early as age 9; by age 17, the greatest differences occurred.

Differing rates of participation in mathematics and science education in elementary and secondary school are partially reflected in scores on the mathematics portion of the Scholastic Aptitude Test (SAT). While scores for blacks and Hispanics are below average by roughly 40 to 90 points, scores for Asians are consistently higher by almost 50 points.

Progress, nonetheless, is evident for minorities, especially for blacks. Over the last decade, scores on precollege assessments of mathematics and science skills have increased much more sharply for blacks than for the majority. In addition, their SAT mathematics scores have been increasing at above average levels.

Differences in participation in mathematics and science may reflect several factors, one of which is opportunity. Minority groups, especially blacks and Hispanics, come from very different socioeconomic backgrounds than the majority. For example, family incomes reported by black and Hispanic freshmen are much lower than the overall average, and these students have to rely heavily on grants and scholarships to finance their education. Furthermore, the parents of these students have much lower levels of education than is the average for all parents, e.g., they are much less likely to hold an undergraduate degree. Finally, high school grade point averages (GPAs) were lower, especially for blacks. On a more positive note, however, these students planned study to the graduate and professional level to a greater extent than average.

Progress by minorities in science and engineering (S/E) education has not been as great at the postsecondary level. Science and engineering degree production has fallen off for blacks but increased for Asians and Hispanics in the last decade. In 1977, blacks accounted for 5.9 percent of S/E bachelor's degrees awarded while Asians represented 1.9 percent and Hispanics, 2.8 percent. By 1987, the share of these degrees granted to blacks had fallen to 5.5 percent; proportions of Asians and Hispanics had increased to 4.8 percent and 3.8 percent, respectively.

Doctorate production in science and engineering has also been below average for minorities among U.S. citizens. While the number of doctorates awarded to black U.S. citizens has fallen over the decade, the number awarded to Asians has changed very little. Only the number of Hispanic U.S. citizens earning doctorates has increased appreciably.

BLACKS

Precollege Preparation[1]

Mathematics and Science Achievement[2]

Mathematics. Blacks scored below whites at all three age levels on the mathematics assessment, but, because of their progress in the last several years, the gap has narrowed (appendix B; table 28). Throughout the last few assessments, the largest variance in performance by blacks and whites has been at the 17-year-old level.

Nine-year-olds. The most recent assessment (1986) showed a difference in overall means for blacks and whites of about 25 points: 201.6 versus 226.9. This difference has diminished since 1978—when it was almost 32 points—as a result of a statistically significant (at the 0.05 level) increase in scores for blacks (192.4 in 1978).

In 1986, there were substantial differences in the levels of proficiency achieved by blacks and whites. A lower percentage of blacks (93 percent) than whites (99 percent) scored above even the lowest level (150—simple arithmetic facts). As the levels increase, so do the differences in percentages. Thus, only about 5 percent of blacks, compared to 25 percent of whites, scored above the 250 level (basic operations and problem solving).

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[1] For explanations and definitions of the data sets and examinations used in this section, see chapter 2, "Education of Women in Science and Engineering."

[2] The assessments conducted by the National Assessment of Educational Progress use a common scale of 0 to 500. Within this scale, proficiency in a subject is broken into five levels.

Thirteen-year-olds. The variation in scores for blacks at this age was similar to that of 9-year-olds. About 24 points separated the overall means for blacks and whites in 1986: 249.2 and 273.6. This gap has narrowed considerably (42 points) since 1978, due to substantial progress made by black 13-year-olds. In the earlier year, their mean was 229.6, 20 points lower than in 1986.

Levels of proficiency continue to vary between blacks and whites. For example, about 49 percent of blacks, but 79 percent of whites, scored above the 250 level (basic operations and problem solving). The proportions scoring over the next highest level, 300—moderately complex procedures and reasoning—were 4 percent (blacks) and 19 percent (whites).

Seventeen-year-olds. The overall mean for blacks in 1986 was 278.6, about 29 points lower than that for whites. This gap has diminished substantially from that of 8 years earlier because of a 10-point increase in black scores.

Almost all students for either race scored over 200 (beginning skills and understanding), but as the levels of proficiency increased, so did the differences between the groups. The proportions scoring over 250 (basic operations and problem solving) were 86 percent for blacks and 98 percent for whites. The shares scoring over 300 (moderately complex procedures and reasoning) were 22 percent and 58 percent, respectively.

Science. The pattern of progress on the science assessment has been similar to that exhibited on the mathematics series (appendix B; table 29). Blacks show mean scores below those for whites at all age levels, especially among 17-year-olds. Substantial progress by blacks since 1978 has begun to close the gaps, however.

Nine-year-olds. The overall mean for blacks in 1986 was about 36 points lower than for whites: 196.2 versus 231.9. Since 1978, though, the mean for blacks has risen from 174.9, closing what was then a 55-point difference.

Differences in levels of proficiency show early, and increase for each proficiency level. At the 150 level (knowledge of everyday facts), 88 percent of blacks, compared to 99 percent of whites, scored higher than this mark. The percentages scoring more than level 200 (understanding simple scientific principles) are 45 (blacks) and 78 (whites).

Thirteen-year-olds. Differences in scores have also narrowed for this age group. In 1978, blacks showed means 43 points lower than those of whites; in 1986, the difference was 33 points. For the most recent year, their respective scores were 226.1 and 259.2.

For this age group, proficiency gaps begin to appear at the lowest levels. About 74 percent of blacks, compared to 96 percent of whites, scored above 200 (simple principles). For scores above level 250 (application of basic scientific knowledge), the proportions were 20 percent (blacks) and 62 percent (whites).

Seventeen-year-olds. The largest variance in means for blacks and whites was for this age group. In 1986, blacks scored 252.8—this was 45 points lower than whites. In 1978, however, the difference was more than 57 points.

Substantial differences between blacks and whites exist for all levels of proficiency but are most acute at the upper ranges. In 1986, roughly 12 percent of blacks and 49 percent of whites scored over 300 (analyses of procedures and data). Proportions scoring over the highest level (350—integration of specialized scientific knowledge) were 1 percent (blacks) and 9 percent (whites).

Characteristics of College-Bound Seniors

Coursework. Data for college-bound seniors (those who take the SAT) show that about the same fractions of blacks and whites take introductory level mathematics and science courses in high school, but that wide disparities begin to emerge at more advanced levels. In 1988, almost all black and white seniors had taken algebra, but higher proportions of whites had taken geometry, trigonometry, or calculus: half the percentage of blacks as whites had taken a calculus course (9 percent versus 18 percent). In addition, about 13 percent of blacks compared to 23 percent of whites had been enrolled in an honors math course.

Science coursework parallels this trend. Almost all students had taken biology, but 31 percent of blacks and 43 percent of whites reported a physics course. Likewise, fewer blacks than whites had been in honors science: 12 percent and 21 percent, respectively.

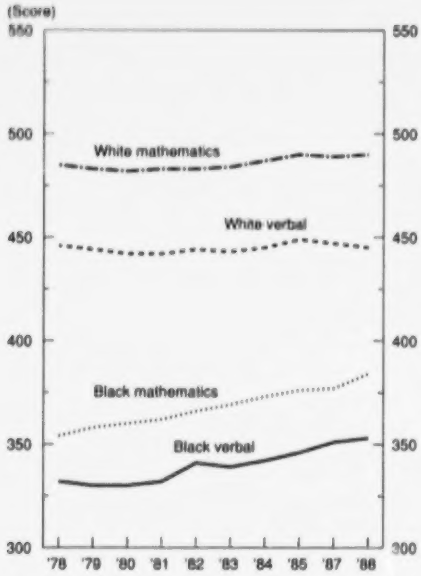
Scholastic Aptitude Test Scores. In 1988, about 97,000 blacks took the SAT, accounting for about 8.6 percent of the total. A majority of these test-takers (about three-fifths) were female.

Although blacks continued to score lower than whites on both components of the SAT in 1988, the differences narrowed during the 1978-88 decade, largely because of (1) increases in scores of blacks compounded with (2) little change in scores for whites (figure 4-1). In 1988, the verbal score for blacks was 353—92 points lower than whites' scores. In 1978, however, the difference in scores was 114 points: 332 (blacks) versus 446 (whites).

Similar progress is evident on the mathematics component. The point difference between black and white scores was 106 in 1988, down from 131 in 1978. Blacks scored 384 in 1988, compared to 490 for whites.

Despite this overall progress, percentile rankings of SAT scores have shown little change for blacks. Less than 1 percent of blacks—versus about 4 percent of whites—scored over 650 on the verbal component in 1988. Similarly, a smaller fraction of blacks (one-fifth) than whites (one-third) scored between 400 and 499.

Figure 4-1. SAT scores for black and white college-bound seniors: 1978-88



Notes: Score range is 200 to 800. Data are not available for 1986.
SOURCE: Appendix B; table 31.

This pattern is the same on the math portion of the exam. In 1988, only 1 percent of blacks, but 10 percent of whites, scored above 650. At lower ranges, however, the differences were not as great: about 25 percent of blacks compared to 30 percent of whites registered scores between 400 and 499.

Achievement Test Scores. About the same fraction of science and mathematics achievement test-takers as all SAT test-takers are black. In 1988, about 4 percent of seniors who had taken one or more of the science and math tests were black and 68 percent were white. Scores for blacks, however, were lower on each of the five exams by roughly 60 to 70 points. The highest score for blacks was recorded on the mathematics level II test (597); their lowest score was on the biology test (489).

SAT mathematics scores for blacks and whites who took one or more of these exams were above the overall average; however, blacks' scores were lower than whites'. The range in scores for blacks on the math test was 498 (mathematics level I) to 583 (physics). For whites, it was 577 (mathematics level I) to 667 (physics).

Advanced Placement (AP) Examinations Scores. About 4 percent of all AP examinations were taken by blacks, while 79 percent were taken by whites in 1988. Percentages for science and mathematics/computer science test-takers are about the same for blacks, but drop off for whites: about 3 percent of both the science and the mathematics/computer science test-takers were black, whereas roughly 72 percent of the examinees were white.

Mean grades for blacks on AP science and mathematics/computer science tests were lower than for whites, and, in 1988, generally fell in the upper 1 (no recommendation for credit) to the mid-2 range (possibly qualified for credit) (table 4-1). Their highest score, however, was 2.98 on the mathematics/calculus BC exam. For whites, the highest score was 3.50 on the mathematics/calculus BC exam. Since the mid-eighties, scores for both blacks and whites have shown a steady decline on most of the science and mathematics/computer science tests. The fields where these declines were most evident were biology and physics C-mechanics.

Table 4-1. AP examination scores for black and white test-takers: 1988

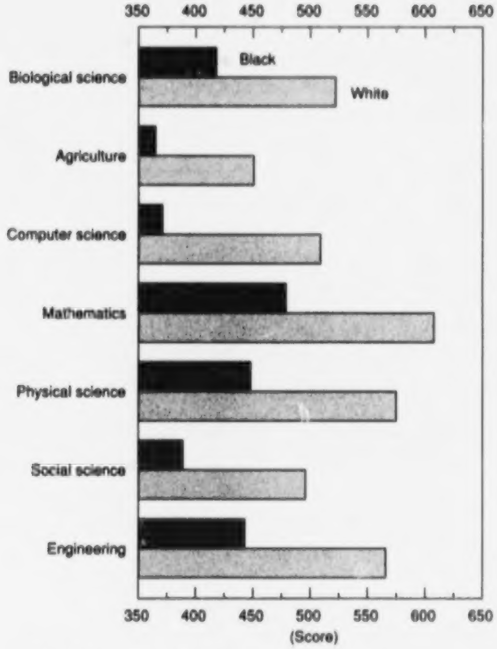
Exam	Black	White
Biology	2.17	3.04
Chemistry	1.99	2.94
Physics B	1.97	2.85
Physics C-mechanics	2.34	3.31
Physics C-electricity and magnetism	2.69	3.28
Mathematics/calculus AB	2.16	3.11
Mathematics/calculus BC	2.98	3.50
Computer science AB	1.81	2.64
Computer science A	1.95	2.94

SOURCE: Appendix B; table 34.

Intended Undergraduate Major. Approximately the same percentages of blacks and whites intended to major in a science field in 1988: 23 percent and 22 percent, respectively. Substantial differences exist by major field. For example, over four-fifths of blacks who intended to major in science chose either computer or social sciences. For whites, the proportion planning study in these fields was about two-thirds. The pattern in math scores for those seniors planning undergraduate study in science was similar to overall trends: blacks scored lower than whites in every field (figure 4-2). The largest difference was among students choosing computer science as their major: 371 versus 509.

About 11 percent of blacks intended to major in engineering in 1988, compared to 9 percent of whites. Since the early eighties, this percentage has remained relatively stable for blacks but has fallen steadily among whites. There was also some narrowing in the score differential on the mathematics exam. In 1988, scores for blacks (443) were 123 points lower

Figure 4-2. SAT mathematics scores for black and white college-bound seniors, by intended S/E major: 1988



Note: Score range is 200 to 800 for each test.
SOURCE: Appendix B; table 35.

than for whites (566); a decade earlier, this difference was 139 points.

Undergraduate Education

Characteristics of American Freshmen[3]

Grade Point Average. There are very large variances in the self-reported high school GPAs of blacks and whites. Less than half as many black freshmen as white in the 1987 freshman class gave their GPA in the "A" range: 12 percent versus 29 percent. A much larger percentage of blacks reported their grades as below the "B" level: 31 percent compared to 13 percent of whites.

Degree Aspirations. Black freshmen tended to aspire to higher degree levels than whites. For example, in 1987, about 17 percent of blacks, compared to 12 percent of whites, planned study to a doctorate. Likewise, higher proportions planned either a law (7 percent versus 5 percent) or medical degree (8 percent versus 6 percent). The baccalaureate, on the other hand, was planned as the highest degree by 26 percent of blacks and 33 percent of whites.

Level of Parents' Education. The level of parental education is somewhat lower for blacks than whites, although the differences are narrower among their mothers than their fathers. Slightly less than a third each of both black and white freshmen reported that their mothers were high school graduates; another 16 percent of blacks and 23 percent of whites indicated that their mothers held a college degree. Differences in the educational level attained by their fathers is much more striking between blacks and whites. For example, 32 percent of black fathers were high school graduates and another 14 percent held college degrees. For whites, these percentages were 22 percent and 25 percent, respectively.

Annual Parental Income. The distribution in estimated parental income shows black income concentrated at lower levels than that for whites (appendix B; table 36). Roughly 38 percent of black freshmen, but only 12 percent of white, gave their parents' income at less than $20,000 per year. At the other end of the spectrum, 20 percent of blacks and 44 percent of whites reported their household income in excess of $50,000.

Plans for Financial Aid. A larger share of blacks than whites were concerned about financing their education. Among the 1987 freshman class, almost 22 percent of blacks indicated that financing college was a major concern; for whites, this proportion was 12 percent. Grants and scholarships were a much more common source of aid for blacks than for whites: about 36 percent of them, compared to 23 percent of whites, received at least partial assistance from this source. Moreover, a lower fraction of blacks than whites cited either personal savings or support from relatives as one of their sources of funding: 37 percent versus 54 percent. Another source of financing—student loans—was reported by 14 percent of blacks and 11 percent of whites.

Probable Career. Black freshmen were more likely than white to choose professional or business fields as their probable career (figure 4-3). For example, about 15 percent of blacks planned to be business managers, another 10 percent wanted to be engineers, and 8 percent wanted to practice law. For whites, these fractions were 13 percent, 8 percent, and 5 percent, respectively. Blacks also were almost half as likely as whites to choose elementary or secondary school teaching as their probable profession: 5 percent versus 9 percent.

Graduate Record Examination (GRE)[4]

In 1987, about 6 percent of Graduate Record Examination test-takers who had majored in a science or engineering field were black. Overall, this proportion was about 5 percent. The trend in GRE scores for blacks and whites mirrored that in SAT scores: although blacks continue to score lower than whites on each of the components, differences have narrowed (table 4-2).

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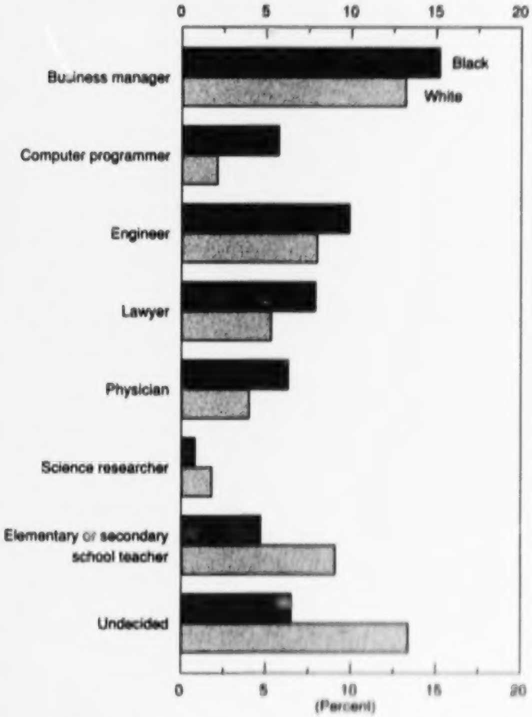
[3] Data by racial/ethnic group are not reliable for those whose probable major is a science or engineering field because of very small sample sizes. As such, data in this chapter for American freshmen reflect the characteristics of all freshmen. Data are from unpublished tabulations.

[4] Data for GRE test-takers are for U.S. citizens only. See chapter 2, "Education of Women in Science and Engineering," for a description of this examination series.

Figure 4-3. Probable career choices of black and white freshmen, by selected occupation: 1987



SOURCE: Appendix B; table 37.

Table 4-2. GRE scores for black and white test-takers, by undergraduate major: 1987

Component and field	Black	White
Verbal		
Physical science	422	546
Mathematical science	371	537
Biological science	404	527
Behavioral science	401	528
Social science	358	486
Engineering	436	532
Quantitative		
Physical science	499	645
Mathematical science	472	673
Biological science	428	581
Behavioral science	382	522
Social science	346	495
Engineering	579	688
Analytical		
Physical science	468	608
Mathematical science	435	639
Biological science	432	582
Behavioral science	409	551
Social science	379	526
Engineering	502	626

Note: Score range is 200 to 800 for each component.
SOURCE: Appendix B; table 38.

On the verbal component, the overall score for blacks was 386, about 130 points lower than for whites (516) in 1987. In addition, scores for blacks who majored in science or engineering at the undergraduate level were lower than those for whites, regardless of field. Differences ranged from 96 points (engineering) to 166 points (mathematical science) in 1987. These differentials have narrowed, however. In 1979, for example, scores for blacks who majored in biological science were 163 points lower than those of whites; by 1987, the difference was 123 points.

Progress has also been made by blacks on the quantitative component of the GRE. In 1987, blacks scored 390—151 points lower than whites. This gap has narrowed from 167 points 8 years earlier. By S/E major, differences in scores vary tremendously. For instance, blacks who majored in mathematical science scored over 200 points lower than whites (472 versus 673), but the difference among engineering majors was 109 points (579 versus 688).

Scores for blacks on the analytical component have also shown significant improvement since the late seventies, although blacks continued to score lower than whites across all S/E fields. In 1987, the overall average score for this group was 404 compared to 554 for whites. This difference of 150 points has diminished from 177 points in 1979. By S/E field, the largest gap in scores was among those who majored in mathematical science—black scores were 204 points lower—while the smallest gap was among engineering majors—124 points.

Bachelor's Degree Production[5]

Between 1977 and 1987, the number of bachelor's degrees in science and engineering awarded to blacks fell from 22,600 to 21,300. In 1987, blacks accounted for 5.5 percent of all S/E baccalaureate recipients.

The overall decline in bachelor's degree production masks very different field trends. While the number of blacks earning degrees in the life and social sciences and psychology fell, the number earning degrees in fields such as computer science and engineering rose dramatically. In the 10-year period from 1977 to 1987, computer science degrees went from 361 to 2,820 while engineering degrees increased from 1,385 to 3,420. Despite these increases, however, a majority (63 percent) of blacks earned their degrees in the life or social sciences and psychology in 1987.

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[5] Data on bachelor's degrees are for U.S. citizens and those on permanent visas. It should be noted that, unlike previous years, nonresponses for 1987 (n = 11,075) were not imputed by the National Center for Education Statistics for racial/ethnic group by field of study.

Graduate Education

Propensity to Attend Graduate School[6]

The proportion of recent graduates with science and engineering degrees who attend graduate school varies little between blacks and whites. Among students who received S/E bachelor's degrees in 1986 or 1987, about one in five of either blacks or whites was enrolled in full-time graduate studies in 1988. By field, there is a greater tendency for science, rather than engineering graduates to enroll full time in graduate school. For example, only about 1 in 10 of black and white engineering graduates was pursuing graduate study on a full-time basis in 1988.

The pattern is similar for recent S/E master's degree recipients. About 21 percent of blacks, and 19 percent of whites, were attending graduate school full time in 1988.

Graduate Enrollment[7]

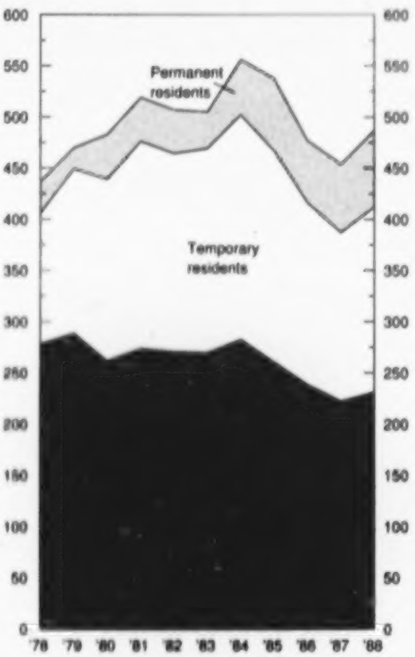
Enrollment of blacks in graduate science and engineering programs rose about 6 percent between 1982[8] and 1988. In 1988, about 12,300 blacks—or 4 percent of all students—were enrolled in graduate studies in S/E fields. By way of comparison, enrollment of whites rose about 7 percent over the 6-year period.

The field distribution of blacks and whites differs substantially. Blacks are more likely than whites to be enrolled in science, especially social science, programs. In 1988, about 87 percent of blacks were in graduate programs in science fields: about one out of every two of these enrollees was in social science. In contrast, 22 percent of whites were in graduate engineering programs.

Advanced Degree Production

Master's Degrees.[9] Production of master's degrees in science and engineering fields has declined steadily for blacks between 1977 and 1985 but increased slightly between 1985 and 1987. In 1977, blacks accounted for 4.3 percent (2,900) of these degree recipients; by 1987, the proportion had dropped to 3.8 percent (2,400). The field distribution of these degrees was similar to that at the bachelor's level. Almost 7 of 10 earned degrees in either the life or social sciences and psychology.

Figure 4-4. Black S/E doctorate recipients, by citizenship: 1978-88



SOURCE: Appendix B, table 47.

Doctorates. The number of doctorates awarded to blacks in science and engineering increased between 1978 and 1988 from 437 to 487 (2.4 percent of the total in 1988). This increase, however, masks two very different trends (figure 4-4). While the number of blacks on temporary or permanent visas earning Ph.D.s increased, the number of U.S. citizen blacks declined. As a result, black U.S. citizens represented less than half—47 percent—of black Ph.D. production in 1988. This number was down from 64 percent a decade earlier. On the other hand, the proportions of temporary black residents rose from 29 percent to 37 percent.

For black U.S. citizens, declines in Ph.D. study were most evident in the physical, mathematical, life, and social sciences. Degrees in these four fields dropped from 169 to 113 over the 10-year period. Engineering doctorates, however, increased from 9 to 19. In 1988, blacks comprised about 1.8 percent of new doctorates awarded to U.S. citizens.

Graduate Support Status

Sources of financial support for new S/E doctorates differed somewhat between blacks and whites. In 1988, blacks were less likely than whites to have reported university support or Federal fellowships as their primary source of assistance for their graduate Ph.D. work. In addition, among those who did report the university as their primary means of financing, lower proportions of blacks than whites held teaching or research assistantships.

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[6] Data for this section are from NSF's biennial Survey of Natural Science, Social Science, and Engineering Graduates. The most recently completed survey was for 1988.

[7] Data on graduate enrollment by racial or ethnic group are for U.S. citizens only.

[8] The earliest year in which comparable data for racial and ethnic groups are available.

[9] Data on master's degrees are for U.S. citizens and those on permanent visas. It should be noted that, unlike previous years, nonresponses for 1987 (n = 4,070) were not imputed by the National Center for Education Statistics for racial/ethnic group by field of study.

These differences are more striking when viewed by citizenship status. For example, for U.S. citizens, primary support sources differed as follows:

- University funding—35 percent (blacks) versus 44 percent (whites),
- Own or family resources—31 percent (blacks) versus 29 percent (whites),
- Federal funding—18 percent (blacks) and 19 percent (whites), and
- Student loans—8 percent (blacks) versus 5 percent (whites).

Among U.S. citizens supported by university funding, lower proportions of blacks than whites were on either teaching (28 percent versus 38 percent) or research assistantships (37 percent versus 47 percent) in 1988. A much higher share of blacks were on fellowships: 28 percent compared to 11 percent of whites.

National Science Foundation (NSF) Fellowships[10]

NSF's Minority Graduate Fellowship Program began in fiscal year (FY) 1978 as an experimental mechanism designed to increase the number of scientists and engineers who are members of those racial and ethnic minority groups traditionally underrepresented in the advanced levels of the Nation's S/E talent pool. In FY 1978, institutional selection was used as the nominating mechanism, and, in FY 1979, the program was redesigned as a national competition to carry out the broadened concept of support of graduate study by minorities.

In FY 1988, the number of applicants to the Minority Fellowship Program was 739, up from 612 in FY 1985, and from 404 in FY 1980. By field, about two-fifths of the applicants were in either engineering, mathematics, or the physical sciences; slightly less than one-third each were in the behavioral and social sciences or life and medical sciences. The engineering field had the highest number of applicants (142) in FY 1988 (appendix B; table 50).

Of the 739 applicants in FY 1988, about 10 percent (75) were offered new awards. An additional 29 percent (214) received honorable mentions. In FY 1980, the fraction of applicants receiving new awards was 14 percent (55) of the 404 applicants. One-third (130) of the applicants also received honorable mentions.

Postdoctoral Appointments

In 1987, there were about 233 blacks with postdoctoral appointments in science and engineering, or roughly 2 percent of the total. This number was more than double that of a decade earlier (104).

Almost all of the postdoctoral appointments for both blacks and whites were in a science field. Only about 6 percent of black and 3 percent of white postdoctorates held appointments in engineering in 1987. Within the sciences, the life sciences was the predominant field for both: about one-half of black and almost two-thirds of white postdoctorates were concentrated in this field.

ASIANS

Precollege Preparation[11]

Characteristics of College-Bound Seniors

College-bound seniors are those secondary students who take the Scholastic Aptitude Test. All students are eligible for this exam, including temporary residents of the United States. The test is used as a criterion in admissions decisions in many U.S. colleges and universities. In 1988, almost two-fifths of Asians who took the examination were not U.S. citizens: 27 percent were permanent residents and about 14 percent were on temporary visas. In contrast, almost all whites (98 percent) were U.S. citizens.

Coursework. Data on the types of mathematics and science coursework taken by college-bound high school seniors indicate that Asians are more prepared academically than are whites. In terms of mathematics coursework, almost all Asians and whites had taken algebra and geometry, but much higher fractions of Asians had taken either trigonometry or calculus in 1988. For example, fully twice the proportion of Asians as whites had a calculus course while in high school: 36 percent versus 18 percent. Asians were also more apt to have been in honors math courses. About one-third of the Asians had been in a top level math course, compared to about one-quarter of whites.

This same picture is evident in science coursetaking. Whereas almost all students had taken biology, Asians reported taking a chemistry or physics course more often than whites. In physics, for instance, relative proportions of Asian and white coursetakers were 63 percent and 43 percent, respectively, in 1988. A larger share of Asians reported an honors course; however, the percentage difference was not as great as that for mathematics coursework: 29 percent versus 21 percent (whites).

Scholastic Aptitude Test Scores. Asians comprised about 5.7 percent (64,000) of college-bound seniors who took the SAT. About equal numbers of Asian males and females took this exam.

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[10] Data for this section are from NSF's Minority Graduate Fellowship Program administered by the Division of Research Career Development in the Directorate for Science and Engineering Education. Minority data are only collected in the aggregate, and include both racial and ethnic minorities. Information presented here is from unpublished data sources.

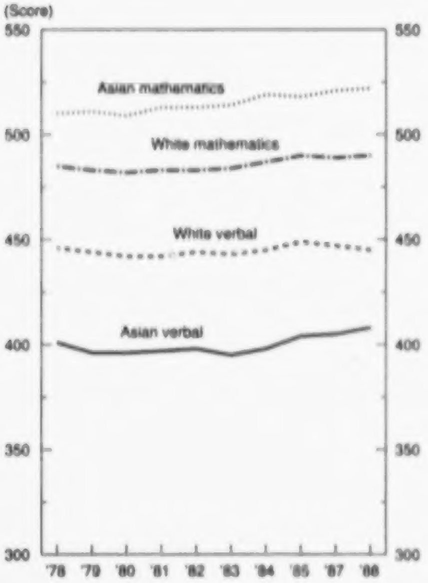
[11] For explanations and definitions of the data sets and examinations used in this section, see chapter 2, "Education of Women in Science and Engineering." Data on mathematics and science achievement from the National Assessment of Educational Progress are not collected separately for Asian students.

Between 1978 and 1988, scores for Asians on the verbal component of the SAT were lower than those for whites; their mathematics scores remained higher, however (figure 4-5). In 1988, Asian verbal scores averaged 408, 37 points lower than the average for whites (445). This differential has closed somewhat during the decade as a result of a steady increase in Asian scores, accompanied by virtually no change in those for whites.

Asians score higher than whites on the mathematics component: this difference has increased over the decade. In 1988, the average score for Asians (522) was 32 points higher than that for whites (490); this differential was up from 25 points a decade earlier. The widening gap is attributable to the fact that scores for Asians increased more than did those for whites.

The percentage of college-bound seniors who scored about 650 on the SAT differed little between Asians and whites on the verbal section. Roughly 4 percent each scored in this range in 1988. On the mathematics component, however, twice the proportion of Asians as whites scored in the top range (650 to 800): 20 percent versus 10 percent.

Figure 4-5. SAT scores for Asian and white college-bound seniors: 1978-88



Notes: Score range is 200 to 800. Data are not available for 1986.

SOURCE: Appendix B; table 31.

Achievement Test Scores. Asians account for a slightly higher percentage of achievement test-takers in science and mathematics than of all test-takers. In 1988, about 14 percent of students who had taken one or more science or math tests were of Asian descent, compared to 12 percent of all test-takers. For whites, the proportions taking these exams were about the same for both: 68 percent.

Asians scored about the same or slightly higher on science and mathematics tests than did whites in 1988. The largest differences in scores were on both the mathematics level I and level II exams. Differentials on these tests were 22 points and 17 points, respectively, in favor of Asians. The SAT mathematics scores for Asians and whites who had taken science and mathematics achievement tests showed the same pattern.

Advanced Placement Examinations Scores. Asians accounted for a larger proportion of students who took one or more AP science and mathematics/computer science exams than they did of all AP test-takers. While Asians accounted for 15 percent of the former group, they comprised only 11 percent of the latter. Whites, in contrast, were not as likely to take the science and mathematics/computer science tests: 72 percent versus an overall concentration of 79 percent.

With the exception of the computer science exams, Asians registered higher grades than whites (table 4-3). While Asians scored roughly 3 (qualified) or above on the science and mathematics/computer science tests, whites tended to score between the mid-2 (possibly qualified) and 3 range. On the computer science exams, however, whites outscored Asians with grades in the mid- to upper-2 range.

Table 4-3. AP examination scores for Asian and white test-takers: 1988

Exam	Asian	White
Biology	3.39	3.04
Chemistry	3.14	2.94
Physics B	2.99	2.85
Physics C-mechanics	3.38	3.31
Physics C-electricity and magnetism	3.34	3.28
Mathematics/calculus AB	3.34	3.11
Mathematics/calculus BC	3.67	3.50
Computer science AB	2.47	2.64
Computer science A	2.88	2.94

SOURCE: Appendix B; table 34.

Intended Undergraduate Major. Whereas Asian and white seniors are about as likely to choose a science field as their intended undergraduate major, Asians are twice as apt to choose an engineering discipline. In 1988, roughly one-fifth of both Asians and whites planned to major in science; in engineering, the proportions were 18 percent and 9 percent, respectively. Within the sciences, Asians tend more toward biology and computer science than whites.

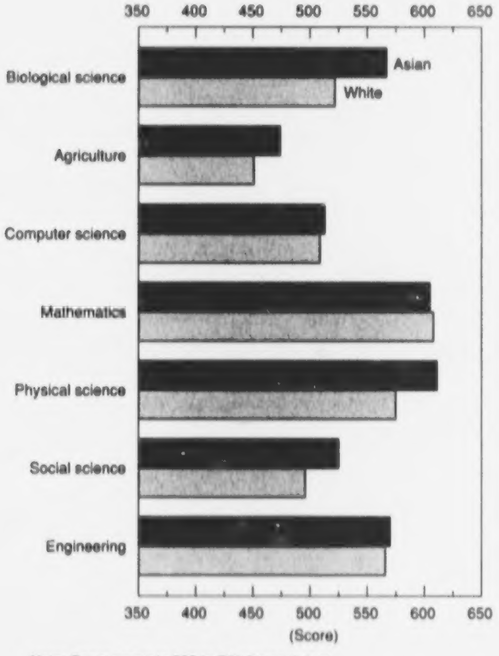
SAT mathematics scores for Asians who intend a science or engineering major are generally higher than those for the comparable population of whites (figure 4-6). The largest differential, 36 points, was for those who intended to major in physical science: 611 for Asians versus 575 for whites.

Undergraduate Education

Characteristics of American Freshmen[12]

Grade Point Average. The self-reported grades of Asian freshmen were substantially higher than those of whites in 1987. While almost half of Asians gave their grade point averages in the "A" range, the proportion for whites was less than one-third. Moreover, twice the percentage of whites as Asians had averages below a "B": 13 percent versus 6 percent.

Figure 4-6. SAT mathematics scores for Asian and white college-bound seniors, by intended S/E major: 1988



Note: Score range is 200 to 800 for each test.
SOURCE: Appendix B, table 35.

Degree Aspirations. More than two of every five Asian freshmen planned their highest degree to be either a doctorate or a medical degree; for whites, this ratio was one of five. Furthermore, a much lower proportion of Asians than whites indicated that their highest degree would be a baccalaureate in 1987: 15 percent versus 33 percent.

Level of Parents' Education. Parents' education levels differ somewhat between Asian and white freshmen. Higher fractions of Asians than whites report their mothers and fathers have less than a high school education. Interestingly, higher fractions of Asians also report that their parents have graduate degrees. For example, 11 percent of Asian freshmen, compared to 7 percent of whites, said their fathers were not high school graduates; almost 37 percent of Asians, and 24 percent of whites also indicated that their fathers held graduate degrees.

Annual Parental Income. Asian freshmen estimate their parents' income as somewhat lower than that of white freshmen. In 1987, about a fifth of Asians and a little more than a tenth of whites reported household income at less than $20,000. Conversely, the fractions reporting income in excess of $50,000 were 39 percent (Asian) and 44 percent (white).

Plans for Financial Aid. A higher proportion of Asians than whites report financing their college education as a major concern; they also are more likely to rely on grants and scholarships as at least one source of aid. In 1987, about 18 percent listed financial means as a major concern; only 12 percent of whites felt this way. As to types of financial assistance, grants and scholarships were a source for 32 percent of Asians and 30 percent of whites.

Probable Career. Coincident with their higher degree aspirations, over one-third of Asian freshmen plan to become either engineers or physicians; this fraction compares to only about a tenth of whites (figure 4-7). Among other careers, Asians choose elementary or secondary teaching as their probable profession to a much lesser extent than do whites: 2 percent versus 9 percent.

Graduate Record Examination[13]

About 4 percent of GRE test-takers who majored in science or engineering at the undergraduate level were Asian; among all test-takers, 3 percent were of Asiatic descent. Asians generally scored lower than whites on the GRE verbal and analytical components, but higher on its quantitative section (table 4-4).

On the verbal component, the overall score for Asians in 1987 was 476, 40 points lower than for whites. Differences in

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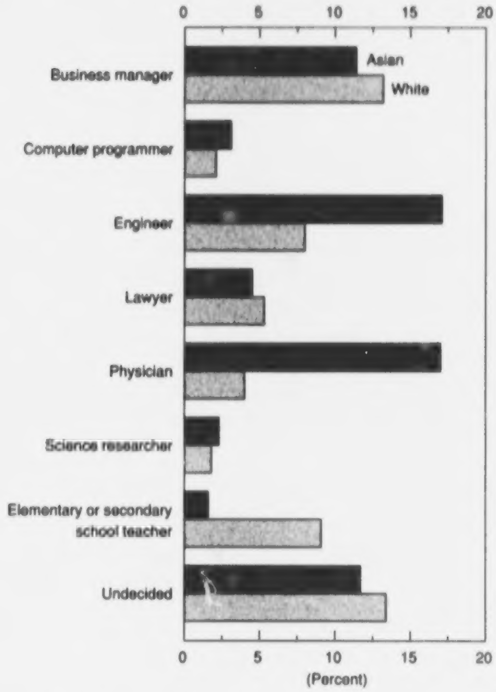
[12] Data by racial/ethnic group are for all freshmen and not just those whose probable major is science or engineering.

[13] Data are for U.S. citizens only. For an explanation of this examination series, see chapter 2, "Education of Women in Science and Engineering."

Figure 4-7. Probable career choices of Asian and white freshmen, by selected occupation: 1987



SOURCE: Appendix B; table 37.

scores for Asians and whites who majored in science and engineering fields varied drastically. For example, Asians who majored in mathematical science recorded verbal scores 96 points lower than those for whites; for biological science graduates, this gap was 16 points.

Scores on the quantitative section in 1987 were 63 points higher for Asians (604 versus 541). This difference varies by S/E major. For instance, while Asian biological science graduates scored 31 points higher than whites, mathematics graduates scored 15 points lower.

The pattern of analytical scores for Asians and whites is similar to that of the verbal section. Overall, Asians scored 537—17 points lower than whites—in 1987. For science and engineering graduates, though, there was wide variation in scores. While there was only an 18-point difference for biological science majors (564 for Asians and 582 for whites), an 86-point gap was evident for those who majored in math (553 and 639, respectively).

Table 4-4. GRE scores for Asian and white test-takers, by undergraduate major: 1987

Component and field	Asian	White
Verbal		
Physical science	516	546
Mathematical science	441	537
Biological science	511	527
Behavioral science	504	528
Social science	460	488
Engineering	451	532
Quantitative		
Physical science	672	645
Mathematical science	658	673
Biological science	612	581
Behavioral science	547	522
Social science	517	495
Engineering	682	688
Analytical		
Physical science	583	608
Mathematical science	553	639
Biological science	564	582
Behavioral science	531	551
Social science	484	526
Engineering	554	626

Note: Score range is 200 to 800 for each component.
SOURCE: Appendix B; table 38.

Bachelor's Degree Production[14]

The number of bachelor's degrees awarded in science and engineering to Asians more than doubled between 1977 and 1987 from 7,100 to about 18,900. Over three-fifths of this increase was due to growth in computer science and engineering degrees. In 1987, about one-third (34 percent) of S/E degrees granted to Asians were in engineering (6,378). Another 22 percent earned degrees in the life sciences (4,107), and 13 percent earned computer science degrees (2,455).

Graduate Education[15]

Propensity to Attend Graduate School

Asian science and engineering degree recipients are much more likely to attend graduate school than are whites. In 1988, almost a third of Asian baccalaureate-holders who received their degrees in either 1986 or 1987 were in graduate school full time. For whites, this fraction was one-fifth.

At the master's level, a majority—57 percent—of Asian S/E graduates were full-time graduate students in 1988. In contrast, about 19 percent of white science and engineering master's recipients were in school full time.

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[14] Data on bachelor's degrees are for U.S. citizens and those on permanent visas. It should be noted that, unlike previous years, nonresponses for 1987 (n = 11,075) were not imputed by the National Center for Education Statistics for racial/ethnic group by field of study.

[15] Data on NSF minority fellowships cannot be disaggregated by racial or ethnic group. For a discussion of these awards for all minorities, however, see the section on National Science Foundation fellowships for blacks.

Graduate Enrollment[16]

Between 1982[17] and 1988, the number of Asians enrolled in graduate science and engineering programs just about doubled, rising from 8,400 to 16,200. In 1988, Asians represented over 5 percent of S/E graduate enrollment. By field, about 40 percent were enrolled in engineering programs; 17 percent were in computer science.

Advanced Degree Production

Master's Degrees.[18] Between 1977 and 1987, the number of S/E master's degrees awarded to Asians rose from 2,000 to 3,900. By 1987, Asians represented about 6 percent of these degree recipients. Most of the growth occurred in the number earning master's degrees in engineering. Degrees in this field rose from 737 to 1,692; by 1987, they accounted for over two-fifths of the S/E master's degree awarded to Asians.

Doctorates. The number of doctorates earned by Asians in science and engineering has also shown a marked increase, rising from 1,900 to 3,700 between 1978 and 1988. In 1988, about 18 percent of new doctorate recipients were Asian. A vast majority of these degrees were earned by non-U.S. citizens on temporary visas (figure 4-8). In 1988, this population comprised 76 percent of Asian doctoral production, up from 57 percent a decade earlier.

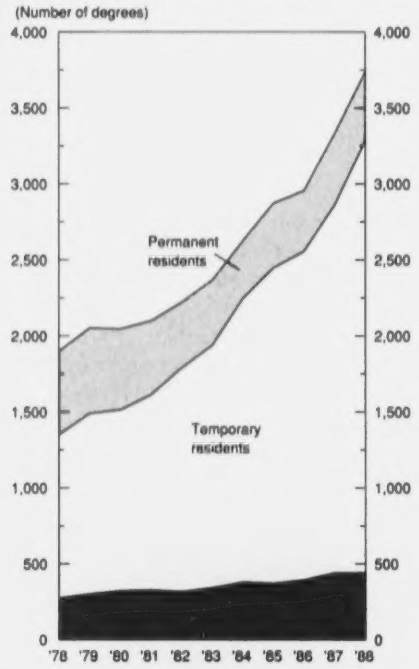
The number of S/E doctorates granted to U.S. citizens who were Asian also increased. In 1988, Asians earned 441 degrees (about 3.4 percent of degrees to all U.S. citizens), up from 275 (2 percent) 10 years earlier. Almost a third of these degree recipients were in engineering subfields; another quarter earned Ph.D.s in the life sciences.

Graduate Support Status

Asians who earned doctorates in science and engineering in 1988 reported primary sources of financial support that differed greatly from those of whites. For example, almost two-thirds of Asians were academically supported—primarily on research assistantships—compared to more than two-fifths (45 percent) of whites. A very different picture emerges, however, when only U.S. citizens who earned these degrees are examined.

Among U.S. citizens who earned S/E doctorates in 1988, about two-fifths of both Asians and whites received university assistance. By type of academic support, Asians were more likely to be on research assistantships than were whites: 55 percent versus 47 percent. Among other types of support, roughly a third of Asians, compared to a fifth of whites, were primarily supported by Federal sources.

Figure 4-8. Asian S/E doctorate recipients, by citizenship: 1978-88



SOURCE: Appendix B; table 47.

Postdoctoral Appointments

In 1987, almost 1,900 Asians had postdoctoral appointments; this number comprised about 15 percent of all S/E postdoctorates. Between 1977 and 1987, the number of Asians with these appointments rose about 37 percent, compared to a 23-percent growth rate for whites. By field, the highest proportions of both Asians and whites were in the life sciences.

NATIVE AMERICANS

Precollege Preparation[19]

Characteristics of College-Bound Seniors

Coursework. Differences in mathematics and science coursetaking behavior between native American and white college-bound seniors are similar to those between blacks and whites. While both are as likely to take introductory coursework, whites take advanced coursework to a much greater extent. For mathematics, the biggest differences arise in trigonometry and calculus. In 1988, for instance, 43 percent of native Americans reported a trigonometry course, while 57 percent of whites did so. For science, the largest variance is in propensity to take physics: 30 percent of native Americans versus 43 percent of whites.

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[16] Data are for U.S. citizens only.

[17] The earliest year in which comparable data for racial and ethnic groups are available.

[18] Data on master's degrees are for U.S. citizens and those on permanent visas. It should be noted that, unlike previous years, nonresponses for 1987 (n = 4,070) were not imputed by the National Center for Education Statistics for racial/ethnic group by field of study.

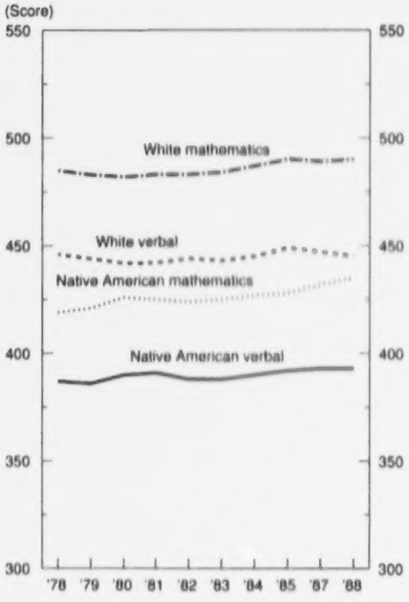
[19] For explanations and definitions of the data sets and examinations used in this section, see chapter 2, "Education of Women in Science and Engineering." Data for the mathematics and science assessments are not disaggregated for native American students.

Scholastic Aptitude Test Scores. Native American representation among SAT registrants was 1.1 percent (12,300) in 1988. About 48 percent of these students were male and 52 percent female.

Native Americans score below whites on both components of the SAT (figure 4-9). While this gap has narrowed somewhat on the mathematics component over the decade, there has been little change on the verbal section. In 1988, the verbal score for native Americans was 393; for whites, it was 445. Since 1978, scores for native Americans have risen only 6 points; for whites, there was a 1-point decline. Native Americans have shown slightly more progress on the mathematics section. In 1988, their score of 435 was 55 points lower than that of whites; in 1978, this difference was 66 points.

Percentile rankings for native Americans show that they are less likely than whites to score above 650 on either component. Only about 1 percent of native Americans, compared to 4 percent of whites, score in the 650 to 800 range on the verbal section. On the mathematics component, the proportions in the highest range were 3 percent (native Americans) and 10 percent (whites).

Figure 4-9. SAT scores for native American and white college-bound seniors: 1978-88



Notes: Score range is 200 to 800. Data are not available for 1986.

SOURCE: Appendix B; table 31.

Achievement Test Scores. Native Americans account for very few of either all achievement test-takers or those who take one or more exams in science and mathematics. In 1988, they comprised only about 0.5 percent of both groups.

Scores for native Americans on all science and mathematics achievement exams were lower than those for whites by between 33 (mathematics level I) and 43 (physics) points. Likewise, SAT mathematics scores for native Americans who took these tests fell behind those for whites.

Advanced Placement Examinations Scores. Native Americans comprise an even smaller fraction of AP test-takers than of those who take achievement tests. In 1988, they represented only about 0.3 percent (804) of all AP test-takers and about the same proportion of those students who take one or more of the science and mathematics/computer science examinations.

Grades on the science and mathematics/computer science tests for native Americans fell between 2 (possibly qualified) and 3 (qualified for college credit) (table 4-5). Their highest grade in 1988, 3.0, was on both physics C exams. Regardless of field, scores for native Americans were below those for whites.

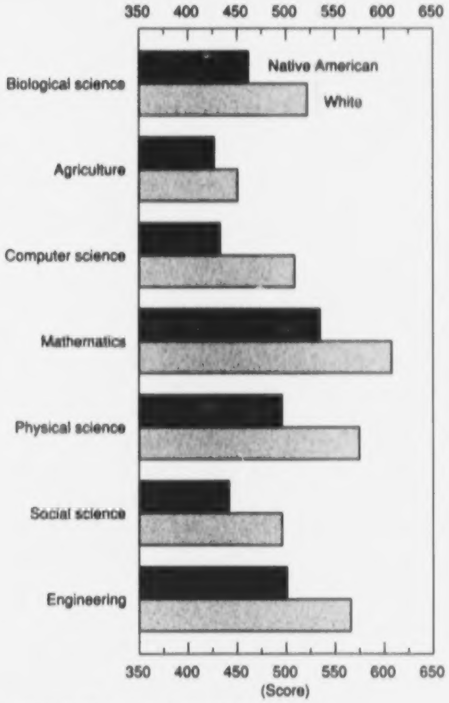
Intended Undergraduate Major. One of every five native American and white seniors planned to major in a science field in 1988. This similarity breaks down by field, however: native Americans were more likely to choose computer science, and whites tended more toward the social sciences. SAT mathematics scores for prospective science majors are lower for native Americans than for whites (figure 4-10). In 1988,

Table 4-5. AP examination scores for native American and white test-takers: 1988

Exam	Native American	White
Biology	2.61	3.04
Chemistry	2.64	2.94
Physics B	2.12	2.85
Physics C-mechanics	3.00	3.31
Physics C-electricity and magnetism	3.00	3.28
Mathematics/calculus AB	2.74	3.11
Mathematics/calculus BC	2.64	3.50
Computer science AB	2.12	2.64
Computer science A	2.75	2.94

SOURCE: Appendix B; table 34.

Figure 4-10. SAT mathematics scores for native American and white college-bound seniors, by intended S/E major: 1988



Note: Score range is 200 to 800 for each test.
SOURCE: Appendix B; table 35.

the largest gap was among potential physical sciences majors; native Americans scored 496 compared to 575 for whites.

About the same percentages of native Americans as whites intended to study engineering: 8 percent and 9 percent, respectively, in 1988. The SAT mathematics scores for these students were 501 for native Americans and 566 for whites.

Undergraduate Education[20]

Graduate Record Examination[21]

In 1987, native American representation among GRE test-takers was 0.6 percent (1,023). This proportion was about the same fraction as had majored in either science or engineering at the undergraduate level. Native Americans score lower than whites on all components of the GRE (table 4-6). These differences are generally not as great on the quantitative and analytical components for those who majored in science and engineering.

On the verbal component, native American scores averaged 471 overall in 1987 compared to 516 for whites. For test-takers who had studied science and engineering, the gaps in scores fell between 25 (physical science) and 48 (biological science) points.

Table 4-6. GRE scores for native American and white test-takers, by undergraduate major: 1987

Component and field	Native American	White
Verbal		
Physical science	521	546
Mathematical science	500	537
Biological science	479	527
Behavioral science	487	528
Social science	447	488
Engineering	487	532
Quantitative		
Physical science	602	645
Mathematical science	652	673
Biological science	521	581
Behavioral science	459	522
Social science	439	495
Engineering	636	688
Analytical		
Physical science	574	608
Mathematical science	615	639
Biological science	510	582
Behavioral science	490	551
Social science	457	526
Engineering	563	626

Note: Score range is 200 to 800 for each component.
SOURCE: Appendix B; table 38.

Native American scores on the quantitative section were almost 70 points lower than white scores in 1987: 473 versus 541. By S/E field, however, these differences did not tend to be as large. For example, native American and white engineering graduates had scores of 636 and 688, respectively.

The pattern in analytical scores roughly duplicated that for quantitative scores. While the score for native Americans overall—487—was 67 points lower than that for whites, differences were generally not as large for science and engineering majors.

Bachelor's Degree Production[22]

In 1987, almost 1,600 science and engineering baccalaureates were granted to native Americans, accounting for 0.4 percent of the total. Although the 10-year trend in degree production shows an overall increase of roughly 20 percent for native

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[20] Data are not disaggregated for native Americans in the American Freshmen Norm Survey.

[21] For an explanation of this examination series, see chapter 2, "Education of Women in Science and Engineering."

[22] Data on bachelor's degrees are for U.S. citizens and those on permanent visas. It should be noted that, unlike previous years, nonresponses for 1987 (n = 11,075) were not imputed by the National Center for Education Statistics for racial/ethnic group by field of study.

Americans, the number of S/E bachelor's degrees dropped by more than 100 between 1985 and 1987.

Graduate Education[23]

Graduate Enrollment

About 1,000 native Americans (0.3 percent) were graduate students in science and engineering programs in 1988. Enrollment in social science programs accounted for the largest share of these students, almost two-fifths. Another one-fifth were in graduate psychology programs. For white graduate students, about 23 percent were in social science and 15 percent were in psychology.

Advanced Degree Production

Master's Degrees.[24] Native Americans also represented about 0.3 percent (222) of the S/E degree recipients at the master's level in 1987. About a third of these degrees were in the life sciences.

Doctorates. There were 43 doctorates granted in science and engineering to native Americans in 1988, up from 22 a decade earlier. This number was roughly 0.2 percent of all S/E doctorate production in 1988.

Graduate Support Status

Native Americans and whites who received their doctorates in science and engineering in 1988 reported very different sources of financial support for their degrees. Almost 44 percent of native Americans cited their own or their family's resources as their primary funding source; for whites, this percentage was 27 percent. Native Americans were much less likely, on the other hand, to be supported by academic sources than whites: 22 percent and 45 percent, respectively.

Postdoctoral Appointments

The number of native American postdoctorates in science and engineering is very low. There were only 24 in 1987; almost all of these were either in the life or social sciences. Their share of all S/E postdoctoral appointments was about 0.2 percent in 1987.

HISPANICS[25]

Precollege Preparation[26]

Mathematics and Science Achievement

Mathematics. With the exception of 13-year-olds, performance on this assessment did not change considerably for Hispanics in the last several years. Regardless of age level, however, Hispanics showed overall means that were lower than those for all students.

Nine-year-olds. The mean score for Hispanic 9-year-olds was 205.4 in 1986, about 16 points lower than that for all students (221.7). There has been little change in the scores for either Hispanic or the total since 1978 (appendix B; table 28).

The first major difference in levels of proficiency for Hispanics and all students shows up at level 200 (beginning skills and understanding). Whereas only 59 percent of Hispanics scored over this mark, 74 percent of all students did so.

Thirteen-year-olds. The most progress made by Hispanics in closing the score gap is at this age level. In 1986, their mean of 254.3 was a little less than 15 points lower than the overall average; in 1978, the score differential had been 26 points.

Differences in proficiency become very noticeable at level 250 (basic operations and problem solving). About 55 percent of Hispanics, compared to 73 percent of all students, scored higher than 250. At the 300 level (moderately complex procedures and reasoning), the percentages were 5 and 16, respectively.

Seventeen-year-olds. There was a 19-point difference in the means of Hispanics and the overall average in 1986: 283.1 versus 302.0. This gap was somewhat reduced—in 1978, the difference was 24 points.

One of the largest variances in proficiency between Hispanics and all students was exhibited at level 300 (moderately complex procedures and reasoning). About half the proportion of Hispanics as of all students scored over this level: 27 percent versus 51 percent.

Science. The only real progress made by Hispanics on this assessment was also at the 13-year old level. For each age group, Hispanic scores were lower than average by about the same point spread.

Nine-year-olds. Hispanics showed an overall mean of 199.4 in 1986; the average for all students was 224.3. This 25-point gap has not changed appreciably from 1978 when it was 28 points.

Variance in proficiency shows up at all levels. For the 150 mark (everyday facts), 90 percent of Hispanics, but 96 percent of all students, scored higher. By level 200 (simple principles), the proportions were 49 percent and 71 percent, respectively.

Thirteen-year-olds. There was an almost 30-point spread in the scores for Hispanics and the overall average at this age in 1986: 221.6 versus 251.4. This gap has narrowed considerably (down from 39 points) since 1978 because of a statistically significant (at the 0.05 level) increase in scores for Hispanics (208.1 in 1978).

Despite this rise in scores, there is still wide variation in levels of proficiency for Hispanics. Whereas about 76 percent of Hispanics scored over level 200 (simple principles), 92 percent of all students did so. At level 250 (application of basic information), about 28 percent of Hispanics, compared to 53 percent of the total, scored above this mark.

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[23] Data on NSF minority fellowships cannot be disaggregated by racial or ethnic group. For the discussion of these awards for all minorities, however, see the section on National Science Foundation fellowships for blacks.

[24] Data on master's degrees are for U.S. citizens and those on permanent visas. It should be noted that, unlike previous years, nonresponses for 1987 (n = 4,070) were not imputed by the National Center for Education Statistics for racial/ethnic group by field of study.

[25] Data for Hispanics are collected in several ways. Wherever possible, this section distinguishes between different Hispanic groups.

[26] For explanations and definitions of the data sets and examinations used in this section, see chapter 2, "Education of Women in Science and Engineering."

Seventeen-year-olds. The point differential in Hispanic and total scores at this level was similar to that for 13-year-olds. In 1986, it was 29 points; there has been little change in it since 1978 (27 points).

Hispanics are scoring at lower proficiency levels than all students with the largest differences occurring at upper levels. For example, while 16 percent of Hispanics scored over 300 (analyzes procedures and data), the percentage for all students was 41. Likewise, less than 1 percent of Hispanics, compared to almost 8 percent of all students, scored above the highest level (350—integration of specialized knowledge).

Characteristics of College-Bound Seniors

Coursework. Mexican American college-bound seniors do not take advanced level mathematics and science courses to the same extent as do all seniors. Coursework for Puerto Ricans and Latin Americans, however, is similar to all college-bound students.

For mathematics coursework, differences are most notable in the proportions who had a trigonometry course. In 1988, about 55 percent of all seniors reported coursework in this subject. Among Hispanics, 43 percent of Mexican Americans, 50 percent of Puerto Ricans, and 54 percent of Latin Americans had taken trigonometry.

In science, the largest difference is evident in physics. About two-fifths of all college-bound seniors took physics in high school, as did the same fractions of Puerto Ricans and Latin Americans. For Mexican Americans, however, only about a third had a physics course.

Scholastic Aptitude Test Scores. The representation of Hispanics among college-bound seniors in 1988 shows that about 2.0 percent (22,722) of the registrants were Mexican American, 1.8 percent (20,213) were Latin American, and 1.0 (11,497) were Puerto Rican. For Hispanics, slightly higher proportions were female in all three groups.

Hispanics continue to score below the national average on both components of the aptitude test, although they have made gains over the last 10 years (figure 4-11). Among Hispanics, scores have increased more for Mexican Americans than for Puerto Ricans on both the verbal and mathematics sections.[27]

Scores for Hispanics on the verbal component were:

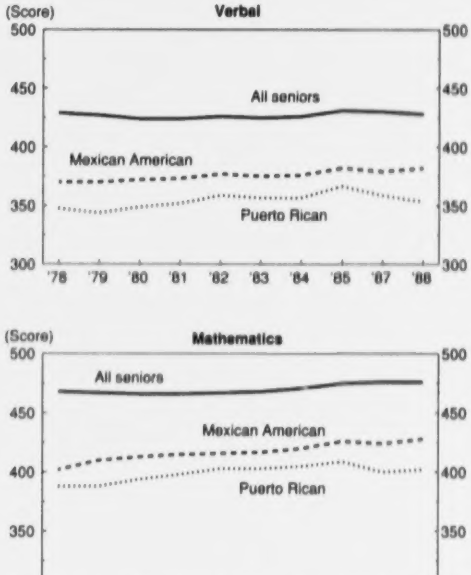
- Latin Americans—387 (41 points below the average for all college-bound seniors),
- Mexican Americans—382 (46 points below, down from 59 points lower in 1978), and
- Puerto Ricans—355 (73 points below, down from 80 points below the average in 1978).

One factor contributing to lower scores of Hispanics may be a language barrier. In 1988, for example, almost 38 percent of Latin American seniors, 32 percent of Puerto Rican seniors, and 16 percent of Mexican Americans reported that English was not the first language they learned; the overall proportion was 5 percent.

On the mathematics component, Hispanics also scored lower than average, with Latin American and Mexican American scores somewhat higher than those for Puerto Ricans. In 1988, scores for Hispanics were:

- Latin Americans—433 (43 points below average),
- Mexican Americans—428 (48 points lower, down from a differential of 66 points in 1978), and
- Puerto Ricans—402 (74 points lower, compared to 80 points lower in 1978).

Figure 4-11. SAT scores for Hispanic and all college-bound seniors: 1978-88



Notes: Score range is 200 to 800. Data are not available for 1986.
SOURCE: Appendix B; table 31.

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[27] Data on Hispanics have been available for Latin Americans, Mexican Americans, and Puerto Ricans since 1987. Prior to that time, data were not collected for Latin Americans.

Only about 1 percent of Latin and Mexican Americans and almost no Puerto Ricans scored in the 650 to 800 range on the verbal test in 1988, compared to 3 percent of all college-bound seniors. On the mathematics component, the percentages of Latin Americans (4 percent) or Mexican Americans and Puerto Ricans (3 percent each) scoring in this range was again much lower than overall (9 percent).

Achievement Test Scores. Less than 4 percent of college-bound seniors who took one or more science and mathematics achievement tests were of Hispanic descent in 1988. This proportion is about the same as their share of all achievement test-takers.

Hispanic college-bound seniors scored lower than did all seniors on the five achievement tests administered in science and mathematics. Unlike the pattern exhibited in scores on the SAT, however, Mexican Americans have the lowest scores among Hispanics. In 1988, the highest achievement test grade for all Hispanics was on the mathematics level II test. Latin Americans scored 640 and had an SAT math score of 621; Puerto Ricans received a 619 and had a corresponding SAT mathematics score of 603; and Mexican Americans obtained a score of 604 on this test and a mathematics score of 590. Overall, students scored 664 on this test and had SAT math scores of 655.

Advanced Placement Examinations Scores. About 13,300 Hispanics (4.6 percent of total test-takers) took an AP exam in 1988. Of these test-takers, 6,345 (48 percent) were Latin American, 5,325 (40 percent) were Mexican American, and 1,652 (12 percent) were Puerto Rican. Hispanics represented a larger fraction of all AP test-takers than of those students who took one or more exams in science and mathematics/computer science (2.9 percent).

Although Hispanics received lower scores than all test-takers on science and mathematics/computer science tests, there was considerable variation by Hispanic subgroup (table 4-7). For example, in 1988, the score ranges were:

- Mexican Americans—1.98 (physics C-mechanics) to 2.67 (mathematics/calculus AB),
- Puerto Ricans—1.57 (computer science AB) to 3.21 (mathematics/calculus BC), and
- Latin Americans—2.04 (computer science AB) to 3.36 (physics C-electricity and magnetism).

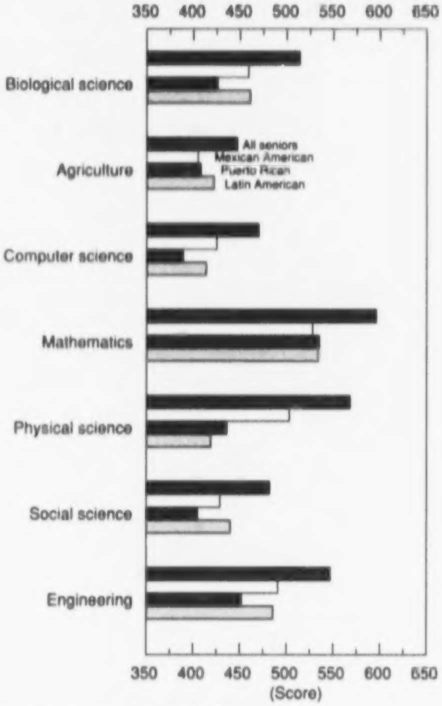
Intended Undergraduate Major. About the same proportion of Hispanic as of all college-bound seniors intend to major in either a science field or engineering. In 1988, slightly more than one-fifth each of Latin Americans, Mexican Americans, and Puerto Ricans planned study in a science field. An additional 12 percent of each group choose engineering. Among Hispanics who planned an S/E major as undergraduates, the highest SAT mathematics scores were for prospective mathematics majors (figure 4-12). Scores for this group ranged from 528 (Mexican Americans) to 535 (Puerto Ricans).

Table 4-7. AP examination scores for Hispanic and all test-takers: 1988

		Hispanic test-takers		
Exam	All test-takers	Mexican American	Puerto Rican	Latin American
Biology	3.05	2.31	2.72	2.67
Chemistry	2.94	2.42	2.69	2.38
Physics B	2.85	2.10	3.06	2.58
Physics C-mechanics	3.29	1.98	2.89	2.73
Physics C-electricity and magnetism	3.29	2.06	2.50	3.36
Mathematics/calculus AB	3.10	2.67	2.47	2.77
Mathematics/calculus BC	3.53	2.59	3.21	3.18
Computer science AB	2.56	2.13	1.57	2.04
Computer science A	2.87	2.45	1.75	2.34

SOURCE: Appendix B; table 34.

Figure 4-12. SAT mathematics scores for Hispanic and all college-bound seniors, by intended S/E major: 1988



Note: Score range is 200 to 800 for each test.
SOURCE: Appendix B; table 35.

Undergraduate Education

Characteristics of American Freshmen[28]

Grade Point Average. The distribution of self-reported grade point averages for Hispanics is very similar to that for all freshmen. While 27 percent of Hispanics showed averages in the "A" range in 1987, about 29 percent of the total did so. There was also little difference at lower levels. The percentages having less than a "B" average were 15 (Hispanics) and 14 (total).

Degree Aspirations. Hispanic freshmen tended to aspire to higher levels of education than did all freshmen. For example, 16 percent planned to study for a doctorate and 10 percent were considering a medical degree. Overall, these proportions were 13 percent and 7 percent, respectively. Moreover, 26 percent of Hispanic and 32 percent of all freshmen reported a baccalaureate as their highest planned degree.

Level of Parents' Education. Substantial differences exist in the level of parents' education as reported by Hispanic and all freshmen. For example, about 31 percent of Hispanic fathers, compared to 8 percent overall, had less than a high school education. In contrast, the percentages who had college degrees were 13 percent (Hispanics) and 24 percent (total). Regarding level of education for their mothers, 29 percent of Hispanics and 6 percent of all freshmen indicated that they did not have a high school diploma.

Annual Parental Income. Estimated parental income is lower for Hispanics than overall. In 1987, fully a third of Hispanic freshmen showed annual income less than $20,000; only an eighth of the total reported income that low. At the highest income levels, $50,000 and above, the fractions were about one-quarter for Hispanics and two-fifths overall.

Plans for Financial Aid. Financing their education was listed as a major concern by 25 percent of Hispanic freshmen in 1987, compared to 14 percent of all freshmen. About 35 percent of Hispanics received assistance through grants or scholarships; overall, the proportion was 25 percent. Also, Hispanics were less likely than all freshmen to rely on relatives or savings to finance their schooling: 37 percent versus 51 percent.

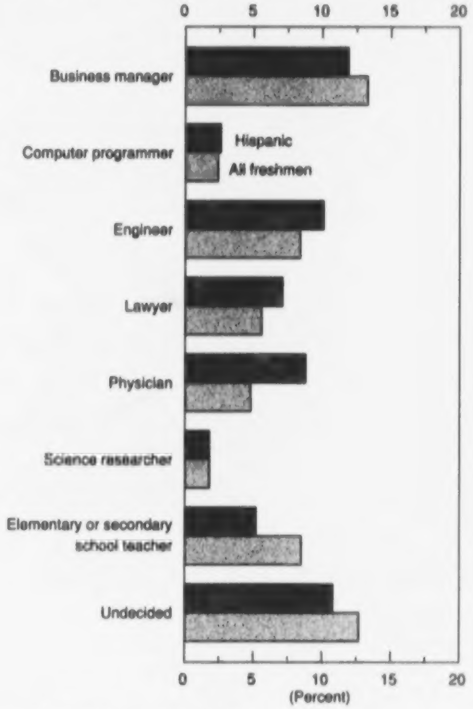
Probable Career. Hispanic freshmen choose engineering, law, and medicine as their probable career fields more often than all freshmen (figure 4-13). For example, 9 percent of Hispanics planned on being physicians compared to 5 percent of all freshmen. Hispanics were not as likely to plan a career in elementary or secondary teaching as all freshmen—5 percent versus 9 percent.

Graduate Record Examination[29]

In 1987, about 3.4 percent (5,789) of GRE test-takers were Hispanic. Specifically, 1.3 percent (2,226) were Mexican American, 1.1 percent (1,902) were Latin American, and 1.0 percent (1,661) were classified as Puerto Rican. The representation of Hispanic GRE test-takers who majored in an S/E field at the undergraduate level was about the same as their overall representation—3.6 percent.

Although Hispanic test-takers who majored in S/E fields scored lower than did all S/E test-takers on the three GRE components, there was wide variation among ethnic subgroups. Scores for Latin Americans were generally higher than those for Mexican Americans or Puerto Ricans among all S/E fields regardless of component (table 4-8). On the verbal component, for example, scores in 1987 were as follows:

Figure 4-13. Probable career choices of Hispanic and all freshmen, by selected occupation: 1987



SOURCE: Appendix B; table 37.

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[28] Data by racial/ethnic group are for all freshmen and not just those whose probable major is science or engineering.

[29] Data are for U.S. citizens only. For an explanation of this examination series, see chapter 2, "Education of Women in Science and Engineering."

Table 4-8. GRE scores for Hispanic and all test-takers by undergraduate major: 1987

		Hispanic test-takers		
Exam	All test-takers	Mexican American	Puerto Rican	Latin American
Verbal				
Physical science	505	490	391	496
Mathematical science	483	472	414	468
Biological science	504	471	360	494
Behavioral science	507	458	401	482
Social science	458	421	361	446
Engineering	466	460	401	477
Quantitative				
Physical science	639	584	517	615
Mathematical science	657	613	573	603
Biological science	570	517	456	542
Behavioral science	513	446	403	479
Social science	479	405	378	436
Engineering	673	626	601	634
Analytical				
Physical science	572	529	437	542
Mathematical science	588	546	491	546
Biological science	557	504	426	528
Behavioral science	530	469	418	500
Social science	494	431	383	458
Engineering	563	539	491	542

Note: Score range is 200 to 800 for each component.
SOURCE: Appendix B; table 38.

- Latin Americans—479, only 12 points lower than the overall average;
- Mexican Americans—457, 34 points lower; and
- Puerto Ricans—390, 101 points lower.

Score differences were greatest on the analytical section; they ranged from 432 for Puerto Ricans (113 points lower than the score for all test-takers) to 514 for Latin Americans (31 points lower). All Hispanics who majored in either physical science, mathematical science, or engineering fields received higher scores on the GRE than did social or life science majors.

Bachelor's Degree Production[30]

In the last 10 years, the number of S/E bachelor's degrees awarded to Hispanics rose steadily from 1977 until the early eighties, declined markedly in 1985, and then increased sharply in 1987. In 1987, about 15,000 S/E baccalaureates were granted to Hispanics, representing about 3.8 percent of the total. Ten years earlier, they represented 2.8 percent (10,900) of the total. Fields showing the largest increases over the decade were computer science (114 to 1,375) and engineering (1,290 to 3,187).

Graduate Education[31]

Propensity to Attend Graduate School

Hispanics who had received their bachelor's degrees in science and engineering in 1986 or 1987 were just as likely as all students to be enrolled in graduate school in 1988: roughly one-fifth. At the master's level, however, a higher fraction of Hispanics than of all students pursued graduate studies on a full-time basis: 27 percent versus 21 percent.

Graduate Enrollment[32]

Hispanics represented 3.3 percent (10,000) of graduate enrollment in science and engineering fields in 1988, up from 2.9 percent 6 years earlier. Driving this proportional increase was a 19-percent growth rate in the number of Hispanics enrolled in S/E programs between 1982 and 1988. In comparison, overall graduate enrollment rose 4 percent during this period.

Hispanics were more likely than all graduate students to be in science rather than engineering programs. By field, Hispanics were more often in social science and psychology (appendix B; table 42). For instance, while 34 percent of Hispanics were in social science, about 24 percent of all graduate students were studying in this field.

Advanced Degree Production

Master's Degrees.[33] Degrees awarded to Hispanics at this level have increased since 1977 from slightly less than 1,600 to almost 2,000 in 1987. As such, their share of all S/E master's degrees rose from 2.3 percent to 3.1 percent. The field distribution of these degrees showed almost three-fifths graduating in either life sciences or engineering.

Doctorates. In 1988, there were 673 doctorates (3.3 percent) in science and engineering granted to Hispanics, up from 420 (2.5 percent) 10 years earlier. Unlike the trend for blacks and Asians, however, the increase largely resulted from higher numbers of Hispanic U.S. citizens earning degrees in these fields (figure 4-14). Over the decade, this number almost doubled from 160 to 319; in 1988, U.S. citizens accounted for almost half the Ph.D.s awarded to Hispanics.

U.S. citizen Hispanics registered growth in many fields. In the sciences, the number of physical sciences Ph.D.s rose from 17 to 56, life sciences doctorates rose from 34 to 74, and psychology Ph.D.s increased from 44 to 89. Degrees in engineering also more than doubled, rising from 19 in 1978 to 43 in 1988.

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[30] Data on bachelor's degrees are for U.S. citizens and those on permanent visas. It should be noted that, unlike previous years, nonresponses for 1987 (n = 11,075) were not imputed by the National Center for Education Statistics for racial/ethnic group by field of study.

[31] Data on NSF minority fellowships cannot be disaggregated by racial or ethnic group. For the discussion of these awards for all minorities, however, see the section on National Science Foundation fellowships for blacks.

[32] Data are for U.S. citizens only.

[33] Data on master's degrees are for U.S. citizens and those on permanent visas. It should be noted that, unlike previous years, nonresponses for 1987 (n = 4,070) were not imputed by the National Center for Education Statistics for racial/ethnic group by field of study.

In 1988, Hispanics accounted for 2.5 percent of new doctorates granted to U.S. citizens.

Graduate Support Status

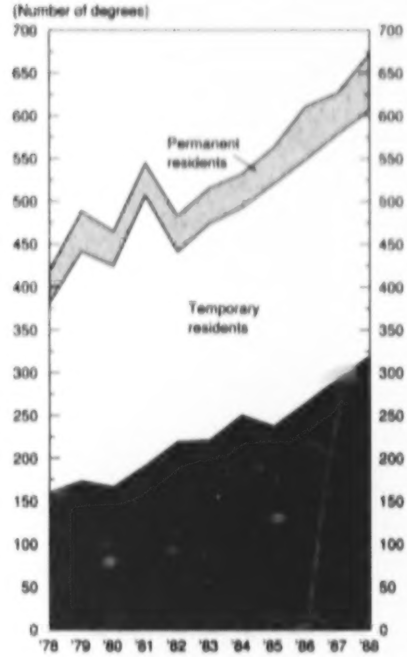
Hispanics who earned doctorates in science and engineering in 1988 showed a different distribution of primary sources of assistance than did all doctorate recipients. For example, roughly two-fifths of Hispanics—compared to almost half of all students—indicated that universities provided their major source of aid. Further differences arise when the data are disaggregated by citizenship.

For U.S. citizens, about 33 percent of Hispanics and 44 percent of all new doctorates reported academia as their major source of support. Within academic institutions, research assistantships were the most frequent type of aid (41 percent for Hispanics and 47 percent overall). Among nonacademic sources, Federal support was reported by 28 percent of Hispanics compared to 19 percent of the total.

Postdoctoral Appointments

About 275 Hispanics held postdoctoral appointments in science and engineering in 1987, up from 136 a decade earlier. Because of this doubling, Hispanics accounted for 2.2 percent of S/E postdoctorates in 1987, compared to 1.4 percent in 1977. By field, more than three-fifths of Hispanic postdoctorates held appointments in the life sciences; the remainder were concentrated primarily in the physical sciences and psychology.

Figure 4-14. Hispanic S/E doctorate recipients, by citizenship: 1978-88



SOURCE: Appendix B; table 47.

SECTION III

Persons With Physical Disabilities

chapter 5

persons with physical disabilities in science and engineering

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chapter 5

persons with physical disabilities in science and engineering

The National Science Foundation's (NSF's) intent in collecting data on persons with physical disabilities is to estimate the number who have a condition that may in some way limit their physical activity. Data on this population, however, are limited for two major reasons. First, samples of these individuals are very small and therefore subject to statistical uncertainty. Second, data on this population are based on self-reported responses to NSF surveys of scientists and engineers. Respondents are asked if they have a physical disability, and, if so, to specify the nature of that disability (visual, auditory, ambulatory, or other). These data therefore reflect individual perceptions.

DEFINITION

Terminology is another factor affecting data reliability. Specifically, terminology makes precise measurement of the number of scientists and engineers who may have a physical disability very difficult. Frequently the terms "disability," "impairment," and "handicap" are used synonymously, but their meanings can have important differences. According to the World Health Organization, *impairment* is a "psychological, anatomical, mental loss, or some other abnormality."[1] *Disability* is any restriction on or lack of ability (resulting from impairment) to pursue an activity—such as work—in the manner or within the range considered normal. Handicap is a disadvantage resulting from an impairment or disability. Thus, an impairment subject to prejudice is a handicap, whether or not it is a disability.

EMPLOYMENT CHARACTERISTICS

In 1986,[2] about 94,200 scientists and engineers—or 2 percent of the total—reported a physical disability. Of those:

- About 22 percent reported an ambulatory condition,
- 22 percent cited a visual condition, and
- Almost 18 percent reported an auditory disability.

The remainder did not specify the nature of their disability.

Labor Force Market Indicators

About 70,300 of those citing a physical disability in 1986 were employed. Two years earlier, about 91,600 reported a physical disability; of those, about 74,800 were employed. The labor force participation rate for the physically disabled thus declined from 83 percent in 1984 to 76 percent in 1986. The corresponding rate for all scientists and engineers in 1986 was 95 percent.

Those reporting a disability are much more likely than all scientists and engineers to be outside the labor force. About 23 percent of the physically disabled cited illness as the reason for not being in the labor force. Among all scientists and engineers, only about 2.6 percent cited illness as their major reason for not working or seeking work.

Among those scientists and engineers who do enter the labor force and seek work, neither the physically disabled nor all scientists and engineers have much difficulty finding jobs. In 1986, the unemployment rate for both was 1.5 percent.

Field

The field distribution of those reporting a physical disability differs only slightly from that for all scientists and engineers (figure 5-1). Those with a disability are about as likely to be scientists and engineers. Among science fields, those with a physical disability are somewhat more likely to be psychologists and less likely to be mathematical or environmental scientists.

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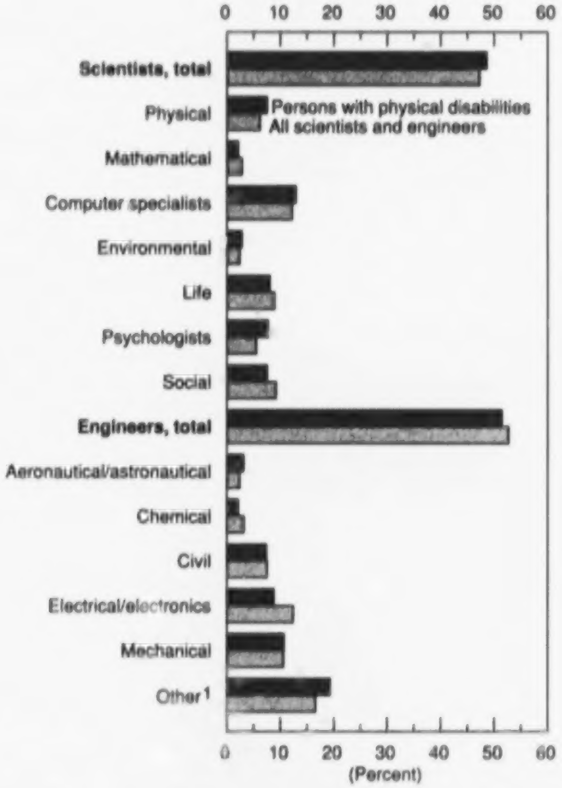
[1] See Johnson and Lambrinos, "Wage Discrimination Against Handicapped Men and Women," *Journal of Human Resources*, Vol. XX, No. 2, Spring 1985, pp. 264-77.

[2] Because of a change in survey schedules, much of the data on the overall population of scientists and engineers cannot be updated. Therefore, the latest reliable data available for persons with physical disabilities are for 1986.

Figure 5-1. Field distribution of employed scientists and engineers and persons with physical disabilities: 1986



[1] Includes industrial, materials, mining, nuclear, petroleum, and other.

SOURCE: Appendix B; based on tables 2 and 6.

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appendix a

technical notes

CONCEPTS AND DEFINITIONS

The National Science Foundation (NSF) publishes a variety of data relating to scientists and engineers. These data—which include estimates of graduate enrollments and degree production as well as the number, work activities, and other economic and demographic characteristics of scientists and engineers—are developed by the Division of Science Resources Studies as part of its ongoing programs. This section presents a brief examination of the major NSF data resources used in this report.

SCIENCE AND ENGINEERING PERSONNEL

Estimates of the characteristics of scientists and engineers in the United States were produced by NSF's Scientific and Technical Personnel Data System (STPDS). Broadly speaking, a person is considered a scientist or engineer if at least two of the following criteria are met:

- Degree in science (including social science) or engineering,
- Employed in a science or engineering occupation, and/or
- Professional identification as a scientist or engineer based on total education and experience.

National Estimates

The STPDS is comprised of three subsystems, each designed to measure the characteristics of a particular subpopulation:

- *The Experienced Sample of Scientists and Engineers* is the follow-up survey to the 1982 Postcensal Survey of Scientists and Engineers. The Postcensal Survey sample was drawn from those individuals who were in the science and engineering (S/E) population at the time of the 1980 census. The Postcensal Survey and the 1984, 1986, and 1989 Experienced Sample surveys were conducted for NSF by the Bureau of the Census. Data from the 1989 survey were not available for use in this report.
- *The Survey of Recent Science and Engineering Graduates* is designed to measure the magnitude and characteristics of those who earned S/E degrees after the 1980 decennial census was completed. During the eighties, the Institute for Survey Research, Temple University, has conducted this survey series for NSF. The most recent survey, conducted in 1988, focuses on the graduating classes of 1986 and 1987.
- *The Survey of Doctorate Recipients* provides information on scientists and engineers granted doctorates in the United States over a 42-year period. The most recent survey, conducted in 1987, covered those individuals who received their doctorates between 1944 and 1986. Since 1973, this survey series has been conducted biennially for NSF by the Office of Scientific and Engineering Personnel, National Academy of Sciences.

In order to produce national estimates, data from the Experienced Sample and Recent Graduate surveys are integrated using a computer-based model. The Science and Engineering Tabulating Model (SETAB), developed for NSF by Mathematica Policy Research, Inc., was used to generate national estimates for 1982, 1984, and 1986. The model may also be used to generate preliminary estimates for future years.

Much of the data on employment characteristics of the overall population of scientists and engineers could not be updated from the 1988 report on women and minorities[1] because of a change in the survey schedule. In the past, NSF data on science and engineering personnel were collected on a biennial basis. The schedule, however, was changed in 1987. One of the major surveys that was to be conducted in 1988 was moved to 1989. Consequently, much of the data on the overall population of scientists and engineers in the United States cannot be updated for this report. Using the SETAB model mentioned above, some estimates have been generated for 1988; for the most part, however, information on the characteristics of scientists and engineers is for 1986.

Selected Variable Definitions

Field of Science and Engineering

Data on field of employment are derived from responses to questions asking the name of the specialty most closely related to the respondent's principal employment. The specialty is chosen from a list provided in each questionnaire. Fields are classified as follows:

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[1] NSF, *Women and Minorities in Science and Engineering*, NSF 88-301 (Washington, DC: NSF, 1988).

- *Physical science:* chemistry, physics, astronomy, and other physical sciences, including metallurgy.
- *Mathematical science:* mathematics and statistics.
- *Computer specialties.*
- *Environmental science:* earth, atmospheric, and oceanographic sciences, including geophysics, seismology, and meteorology.
- *Life science:* biological, agricultural, and medical sciences (excluding those engaged in patient care).
- *Psychology.*
- *Social science:* economics, including agricultural economics; sociology; anthropology; and all other social sciences.
- *Engineering:* aeronautical/astronautical, chemical, civil, electrical/electronics, materials science, mechanical, nuclear, petroleum, and other engineering.

Work Activities

Data on work activities of scientists and engineers represent their primary work activities. These data are derived from responses to survey questions which ask individuals to select, from a list of 10 to 15 choices, their primary work activities. Work activities are classified as follows:

- *Research and development (R&D):* basic research; applied research; development; and design of equipment, processes, and models.
- *Management of R&D:* management or administration of research and development.
- *General management:* management or administration of activities other than research and development.
- *Teaching:* teaching and training.
- *Production/inspection:* quality control, testing, evaluation, or inspection; and operations including production, maintenance, construction, installation, and exploration.
- *Reporting, statistical work, and computing:* report and technical writing, editing, and information retrieval; statistical work including survey work, forecasting, and statistical analysis; and computer applications.

Additional work activities for which information is collected include distribution (sales, traffic, purchasing, customer and public relations), consulting, and other activities.

Statistical Measures

Labor Force Participation Rate

The labor force is defined as those employed and those seeking employment. The labor force participation rate is the ratio of those employed and those unemployed to the population.

Unemployment Rate

The unemployment rate shows the ratio of those who are unemployed but seeking employment to the total labor force.

S/E Underemployment Rate

The S/E underemployment rate shows the ratio of those who are working part time but seeking full-time jobs or who are working in a non-S/E job when an S/E job would be preferred to total employment.

Reliability of Science and Engineering Estimates

Estimates of scientists and engineers are derived from sample surveys and thus are subject to both sampling and nonsampling errors.

Sampling Errors

The sample used for a particular survey is only one of many possible samples of the same size that could have been selected using the same sample design. Even if the same questionnaire and instructions were used, the estimates from each of the samples would differ. The deviation of the estimated sample from the average of all possible samples is defined as "sampling error." The standard error of a survey estimate attempts to provide a measure of this variation. Standard errors are thus indicators of the degree of precision with which a sample estimate approximates the average results for all possible samples.

Approximate sampling errors for national estimates of scientists and engineers, doctoral scientists and engineers, and recent science and engineering graduates may be obtained from the Division of Science Resources Studies at the address shown below.

Nonsampling errors

Nonsampling errors may be attributed to many sources: inability to obtain information about all cases; definitional difficulties; differences in the interpretation of questions; respondents' inability or unwillingness to provide correct information; mistakes in recording or coding the information; and other errors in collection, response, processing, coverage, and imputation.

Nonsampling errors are not unique to samples; they can occur in complete canvasses as well. No systematic attempt has been made to identify or approximate the magnitude of nonsampling errors associated with the estimates of scientists and engineers presented in this report.

GRADUATE ENROLLMENT

National estimates of graduate S/E enrollments are from the Annual Survey of Graduate Science and Engineering Students and Postdoctorates, currently conducted for NSF by Quantum Research Corporation. The survey universe is composed of all institutions in the United States with departments or programs offering courses of study at the postbaccalaureate level in any S/E field. Included are medical schools and other specialized institutions offering first-professional doctorates in health-related fields.

EARNED DEGREES

Bachelor's and Master's Degrees

Data on earned degrees in science and engineering at the bachelor's and master's levels are collected by the National Center for Education Statistics of the U.S. Department of Education. These data cover earned degrees conferred in the aggregate United States, which includes the 50 states, the District of Columbia, and outlying areas. Degree data are compiled for the 12-month period from July through the following June.

Doctorates

Data on doctorates granted in science and engineering are developed from the Survey of Earned Doctorates, conducted for NSF by the Office of Science and Engineering Personnel, National Academy of Sciences. These data cover all types of doctoral degrees with the exception of such first-professional degrees as the J.D. or M.D. Data are collected for the aggregate United States and cover the period from July to the following June.

ADDITIONAL INFORMATION ON NATIONAL SCIENCE FOUNDATION DATA SOURCES

A brief description of each survey and copies of the survey instruments may be found in *A Guide to NSF Science Resources Data.*[2] The *Guide* is available from the Office of the Division Director, Division of Science Resources Studies, 1800 G Street N.W., Room L-602, National Science Foundation, Washington, DC 20550.

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[2] NSF, *A Guide to NSF Science/Engineering Resources Data*, NSF 87-308 (Washington, DC: NSF, 1987).

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Total, all fields	2,609,800	2,367,600	242,200	2,416,500	47,700	108,800	NA	NA
Scientists, total	1,071,000	857,600	213,400	989,800	26,900	38,800	NA	NA
Physical scientists	208,300	189,800	18,500	194,500	3,500	8,700	NA	NA
Chemists	143,000	127,900	15,100	132,600	2,900	6,800	NA	NA
Physicists/astronomers	46,400	44,300	2,100	44,300	500	1,200	NA	NA
Other physical scientists	18,800	17,500	1,300	17,600	100	600	NA	NA
Mathematical scientists	53,700	40,500	13,100	49,400	2,800	1,500	NA	NA
Mathematicians	46,300	35,400	10,900	42,700	2,500	1,100	NA	NA
Statisticians	7,300	5,200	2,200	6,600	300	400	NA	NA
Computer specialists	177,000	136,800	40,200	164,500	3,200	8,400	NA	NA
Environmental scientists	68,900	61,700	7,200	60,400	700	1,900	NA	NA
Earth scientists	54,000	47,900	6,100	49,700	200	1,300	NA	NA
Oceanographers	7,300	6,900	400	3,700	500	100	NA	NA
Atmospheric scientists	7,600	6,900	700	7,000	(3)	600	NA	NA
Life scientists	244,100	204,500	39,600	229,100	5,700	6,300	NA	NA
Biological scientists	164,000	134,000	30,000	153,100	4,500	4,100	NA	NA
Agricultural scientists	49,600	46,400	3,200	47,500	800	1,100	NA	NA
Medical scientists	30,500	24,000	6,400	28,500	400	1,100	NA	NA
Psychologists	121,700	79,700	42,000	115,300	3,800	700	NA	NA
Social scientists	197,400	144,600	52,800	176,700	7,200	11,300	NA	NA
Economists	62,100	55,000	7,000	56,500	400	4,500	NA	NA
Sociologists/anthropologists	40,900	26,400	14,600	35,400	2,300	1,600	NA	NA
Other social scientists	94,400	63,200	31,300	84,700	4,500	5,200	NA	NA
Engineers, total	1,538,800	1,510,000	28,800	1,426,700	20,800	70,000	NA	NA
Aeronautical/astronautical	62,000	61,400	600	57,800	1,000	2,000	NA	NA
Chemical	84,200	81,700	2,500	78,300	300	4,000	NA	NA
Civil	211,700	208,400	3,300	191,300	2,700	14,800	NA	NA
Electrical/electronics	341,500	338,000	3,500	310,700	5,800	20,200	NA	NA
Industrial	NA	NA	NA	NA	NA	NA	NA	NA
Materials	NA	NA	NA	NA	NA	NA	NA	NA
Mechanical	299,300	295,200	4,100	280,200	2,300	12,800	NA	NA
Mining	NA	NA	NA	NA	NA	NA	NA	NA
Nuclear	NA	NA	NA	NA	NA	NA	NA	NA
Petroleum	NA	NA	NA	NA	NA	NA	NA	NA
Other engineers	540,100	525,400	14,700	508,300	8,800	16,200	NA	NA

See footnotes at end of table.

Table 1. - continued

Field	1988							
	Total (1)	Men	Women	White	Black	Asian	Native American	Hispanic (2)
Total, all fields	5,286,400	4,417,400	867,900	4,761,900	139,200	268,100	21,900	95,900
Scientists, total	2,567,800	1,821,500	745,700	2,299,400	94,800	117,100	8,700	43,800
Physical scientists	312,000	265,500	46,500	279,500	6,500	20,600	700	5,200
Chemists	197,000	161,800	35,300	174,600	4,800	15,100	400	3,100
Physicists/astronomers	77,800	72,600	5,200	70,800	900	4,400	300	1,900
Other physical scientists	37,100	31,100	6,000	34,200	800	1,100	100	300
Mathematical scientists	168,600	123,600	44,900	145,700	9,500	9,200	200	3,900
Mathematicians	145,100	106,400	38,700	125,100	8,900	7,300	200	3,400
Statisticians	23,500	17,300	6,200	20,500	600	1,900	(3)	400
Computer specialists	708,300	489,300	218,700	625,300	26,000	46,900	400	8,700
Environmental scientists	113,400	101,000	12,300	107,100	1,000	1,600	700	2,100
Earth scientists	94,200	83,000	11,100	89,400	700	1,200	400	1,800
Oceanographers	4,600	3,900	700	3,800	100	100	300	200
Atmospheric scientists	14,600	14,000	500	13,900	100	200	(3)	100
Life scientists	458,600	330,800	127,700	413,900	9,500	20,100	3,400	10,100
Biological scientists	299,400	210,100	89,200	267,700	7,700	15,200	1,400	7,000
Agricultural scientists	124,000	92,800	31,200	113,600	1,400	2,900	1,900	2,900
Medical scientists	35,200	27,900	7,300	32,500	400	1,900	100	300
Psychologists	275,900	143,900	132,000	256,000	10,100	4,600	1,100	4,700
Social scientists	531,000	367,300	163,700	472,000	32,300	14,200	2,000	9,000
Economists	219,800	174,900	44,900	199,300	8,400	7,000	1,300	4,700
Sociologists/anthropologists	93,900	48,400	45,500	78,400	8,800	3,700	400	2,600
Other social scientists	217,300	143,900	73,400	194,400	15,100	3,500	300	1,700
Engineers, total	2,718,600	2,596,000	122,200	2,462,500	44,400	151,000	13,200	52,100
Aeronautical/astronautical	119,400	114,200	5,300	106,900	1,600	9,300	300	1,400
Chemical	148,500	136,000	12,500	136,000	1,700	8,000	600	2,600
Civil	355,900	346,600	9,300	316,100	6,200	25,400	900	7,100
Electrical/electronics	640,900	616,900	23,800	570,700	11,000	44,000	2,800	13,600
Industrial	172,300	160,900	11,400	160,300	3,100	5,000	1,200	3,400
Materials	65,600	61,800	3,700	59,300	600	4,400	400	800
Mechanical	497,800	480,900	16,900	455,700	7,100	26,300	2,100	8,500
Mining	21,300	20,300	900	20,600	(3)	500	(3)	200
Nuclear	29,000	27,800	1,200	26,400	500	2,000	(3)	100
Petroleum	37,400	35,300	2,100	34,500	400	400	900	800
Other engineers	630,400	595,200	35,100	575,900	12,300	25,800	4,100	13,600

(1) Detail will not add to total because
a) racial and ethnic categories are not mutually exclusive and
b) total includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.
NA: Not available.

NOTE: Detail may not add to total because of rounding.
SOURCE: National Science Foundation, SRS.

Table 2. Employed men and women scientists and engineers, by field, and racial/ethnic group: 1986

Field and gender	Total Employed (1)	White	Black	Asian	Native American	Hispanic (2)
Total, all fields	4,626,500	4,190,400	114,900	226,800	23,600	93,400
Men	3,927,800	3,581,500	80,500	190,500	21,000	73,800
Women	698,600	608,900	34,500	36,300	2,700	19,600
Scientists, total	2,186,300	1,973,100	73,700	94,000	10,300	46,100
Men	1,586,700	1,448,300	43,600	65,000	7,9000	29,800
Women	599,600	524,800	30,100	29,000	2,400	16,400
Physical scientists	288,400	261,800	6,200	15,400	1,000	4,800
Men	250,100	230,100	4,500	11,200	1,000	3,900
Women	38,300	31,700	1,700	4,200	(3)	900
Mathematical scientists	131,000	115,500	6,800	5,900	200	3,100
Men	97,100	85,200	4,500	5,100	100	1,900
Women	33,900	30,300	2,300	800	100	1,200
Computer specialists	562,600	497,100	18,900	36,100	2,200	9,300
Men	400,000	354,100	11,700	27,300	1,800	6,400
Women	162,500	143,000	7,200	8,800	400	2,900
Environmental scientists	111,300	105,800	1,000	2,100	400	1,800
Men	98,400	93,400	900	2,000	400	1,700
Women	12,900	12,400	100	200	100	200
Life scientists	411,800	377,900	8,800	15,000	2,800	9,900
Men	309,000	288,900	5,500	9,400	1,800	5,900
Women	102,800	89,100	3,300	5,600	1,000	4,100
Psychologists	253,500	234,100	9,100	5,200	1,900	5,900
Men	138,400	131,700	3,100	800	1,400	2,700
Women	115,200	102,500	6,000	4,400	500	3,100
Social scientists	427,800	380,800	22,900	14,200	1,700	11,400
Men	293,800	265,000	13,500	9,200	1,300	7,400
Women	134,000	115,800	9,400	5,000	400	4,000
Engineers, total	2,440,100	2,217,300	41,300	132,800	13,300	47,200
Men	2,341,100	2,133,200	36,900	125,500	13,100	44,000
Women	99,000	84,100	4,400	7,300	300	3,200

(1) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation, SRS.

Table 3. Employed doctoral scientists and engineers, by field, gender, and racial/ethnic group: 1977 and 1987

Field	1977							
	Total (1)	Men	Women	White	Black	Asian	Native American	Hispanic (2)
Total, all fields	285,000	257,500	27,600	258,400	2,700	16,300	200	2,700
Scientists, total	240,000	212,700	27,300	219,800	2,600	11,200	200	2,300
Physical scientists	57,600	54,600	2,900	52,000	500	3,400	(3)	500
Chemists	37,400	35,000	2,400	33,900	400	2,200	(3)	300
Physicists/astronomers	20,100	19,600	600	18,100	100	1,200	(3)	200
Mathematical scientists	14,500	13,500	1,000	13,200	100	800	(3)	200
Mathematicians	12,800	11,900	900	11,600	100	700	(3)	100
Statisticians	1,800	1,600	100	1,600	(3)	100	(3)	(3)
Computer specialists	5,800	5,500	200	5,000	(3)	600	(3)	(3)
Environmental scientists	13,000	12,600	400	12,200	(3)	600	(3)	100
Earth scientists	9,700	9,400	300	9,100	(3)	400	(3)	100
Oceanographers	1,600	1,500	100	1,400	(3)	100	(3)	(3)
Atmospheric scientists	1,700	1,700	100	1,600	(3)	100	(3)	(3)
Life scientists	70,600	61,500	9,100	64,300	800	4,000	100	700
Biological scientists	42,100	35,400	6,700	38,200	500	2,400	(3)	400
Agricultural scientists	12,100	11,900	200	11,300	100	500	(3)	100
Medical scientists	16,400	14,200	2,200	14,700	200	1,100	(3)	200
Psychologists	33,700	26,100	7,600	32,000	500	300	100	300
Social scientists	44,900	39,000	6,000	41,200	700	1,500	100	500
Economists	13,000	12,200	800	11,800	100	600	(3)	200
Sociologists/anthropologists	9,500	7,200	2,300	8,700	100	300	(3)	100
Other social scientists	22,500	19,600	2,900	20,700	400	600	(3)	200
Engineers, total	45,100	44,800	300	38,600	100	5,100	(3)	400
Aeronautical/astronautical	2,000	2,000	(3)	1,800	(3)	100	(3)	(3)
Chemical	5,600	5,600	(3)	4,700	(3)	700	(3)	100
Civil	4,100	4,100	(3)	3,300	(3)	700	(3)	(3)
Electrical/electronics	8,300	8,200	(3)	7,200	(3)	800	(3)	100
Materials science	5,200	5,200	(3)	4,600	(3)	600	(3)	100
Mechanical	4,600	4,600	(3)	3,800	(3)	800	(3)	(3)
Nuclear	1,800	1,800	(3)	1,500	(3)	200	(3)	(3)
Systems design	3,600	3,500	(3)	3,200	(3)	300	(3)	(3)
Other engineers	9,900	9,800	100	8,600	(3)	800	(3)	100

Table 3. - continued

Field	1987							
	Total (1)	Men	Women	White	Black	Asian	Native American	Hispanic (2)
Total, all fields	419,100	352,400	66,700	373,000	6,400	36,400	500	6,900
Scientists, total	351,300	286,300	65,000	319,000	5,700	23,600	500	5,900
Physical scientists	68,600	63,200	5,500	60,800	600	6,800	100	1,000
Chemists	44,100	39,700	4,500	38,600	500	4,700	100	700
Physicists/astronomers	24,500	23,500	1,000	22,100	100	2,000	(3)	400
Mathematical scientists	16,600	15,000	1,600	14,900	200	1,500	(3)	300
Mathematicans	13,700	12,500	1,300	12,500	100	1,000	(3)	200
Statisticians	2,900	2,500	300	2,300	(3)	500	(3)	(3)
Computer specialists	18,600	16,700	1,900	16,200	200	1,800	(3)	300
Environmental scientists	17,800	16,500	1,300	16,600	200	900	(3)	300
Earth scientists	13,600	12,600	1,000	12,600	200	800	(3)	200
Oceanographers	2,000	1,800	200	1,900	(3)	100	(3)	100
Atmospheric scientists	2,200	2,100	100	2,100	(3)	100	(3)	(3)
Life scientists	107,400	85,300	22,100	97,000	1,500	8,200	100	1,600
Biological scientists	62,000	48,500	13,500	56,100	800	4,700	100	700
Agricultural scientists	15,800	14,700	1,100	14,600	100	1,000	(3)	400
Medical scientists	29,600	22,100	7,500	26,300	500	2,500	(3)	400
Psychologists	56,400	37,300	19,100	53,700	1,300	900	100	1,000
Social scientists	65,900	52,400	13,500	60,000	1,800	3,500	100	1,400
Economists	17,800	15,800	2,000	16,000	300	1,400	(3)	500
Sociologists/anthropologists	12,900	9,000	3,900	12,000	300	500	100	200
Other social scientists	35,100	27,500	7,600	32,000	1,100	1,700	(3)	700
Engineers, total	67,800	66,100	1,700	53,900	700	12,800	(3)	1,100
Aeronautical/astronautical	5,000	4,900	100	4,100	(3)	900	(3)	(3)
Chemical	6,900	6,800	100	5,000	100	1,800	(3)	100
Civil	6,500	6,300	200	5,200	(3)	1,300	(3)	100
Electrical/electronics	12,600	12,300	400	9,800	200	2,500	(3)	100
Materials science	8,100	7,800	200	6,700	(3)	1,300	(3)	100
Mechanical	6,700	6,600	100	5,100	100	1,400	(3)	100
Nuclear	2,200	2,100	(3)	1,700	(3)	400	(3)	(3)
Systems design	3,900	3,800	200	3,500	(3)	300	(3)	200
Other engineers	15,800	15,400	400	12,800	100	2,800	(3)	300

(1) Detail will not add to total employed because
    a) racial and ethnic categories are not mutually exclusive and
    b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

NOTE: Detail may not add to total because of rounding.
SOURCE: National Science Foundation, SRS.

Table 4. Employed doctoral men and women scientists and engineers, by field, gender, and racial/ethnic group: 1987

Field and gender	Total (1)	White	Black	Asian	Native American	Hispanic (2)
Total, all fields	419,100	373,000	6,400	36,400	500	6,900
Men	352,400	313,000	4,400	32,000	400	5,700
Women	66,700	60,000	1,900	4,400	100	1,200
Scientists, total	351,300	319,000	5,700	23,600	500	5,900
Men	286,300	260,400	3,800	19,600	400	4,700
Women	65,000	58,600	1,900	4,100	100	1,200
Physical scientists	68,600	60,800	600	6,800	100	1,000
Men	63,200	56,300	500	5,900	100	900
Women	5,500	4,500	100	900	(3)	100
Mathematical scientists	16,600	14,900	200	1,500	(3)	300
Men	15,000	13,500	100	1,300	(3)	200
Women	1,600	1,400	(3)	200	(3)	(3)
Computer specialists	18,600	16,200	200	1,800	(3)	300
Men	16,700	14,600	200	1,600	(3)	300
Women	1,900	1,700	(3)	200	(3)	(3)
Environmental scientists	17,800	16,600	200	900	(3)	300
Men	16,500	15,400	200	800	(3)	300
Women	1,300	1,200	(3)	100	(3)	(3)
Life scientists	107,400	97,000	1,500	8,200	100	1,600
Men	85,300	77,300	900	6,400	100	1,200
Women	22,100	19,600	500	1,800	(3)	300
Psychologists	56,400	53,700	1,300	900	100	1,000
Men	37,300	35,800	600	500	100	600
Women	19,100	17,900	700	400	(3)	400
Social scientists	65,900	60,000	1,800	3,500	100	1,400
Men	52,400	47,600	1,200	3,000	100	1,100
Women	13,500	12,400	600	500	(3)	300
Engineers, total	67,800	53,900	700	12,800	(3)	1,100
Men	66,100	52,600	600	12,400	(3)	1,100
Women	1,700	1,300	100	300	(3)	(3)

(1) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

NOTE: Detail may not add to total because of rounding.
SOURCE: National Science Foundation, SRS.

Table 5. Employed recent science and engineering graduates, by degree level, field, gender, and racial/ethnic group: 1988-Continued

(Exclusive of Full-time Graduate Students)

Field of degree	Bachelor's Recipients (3)							
	Total (1)	Men	Women	White	Black	Asian	Native American	Hispanic (2)
Total, all fields	484,800	311,700	173,000	407,400	19,700	18,400	2,500	15,800
Sciences, total	346,200	192,100	154,100	291,900	14,800	11,400	1,900	11,200
Physical sciences	18,400	11,200	5,100	13,800	700	400	0	500
Chemistry	9,600	5,800	3,800	7,900	500	300	0	400
Physics/astronomy	4,600	3,900	700	4,100	100	0	(4)	0
Other physical sciences	2,200	1,500	600	1,700	100	100	(4)	100
Math/Statistics	26,400	14,200	12,200	23,100	1,000	800	(4)	700
Computer science	73,000	47,800	25,200	59,900	2,900	4,000	300	2,300
Environmental science	7,100	5,600	1,500	6,500	100	100	(4)	100
Life sciences	56,100	28,700	27,500	47,600	1,500	2,600	300	1,500
Biology	39,500	17,500	22,000	33,400	1,400	2,300	200	1,100
Agricultural sciences	16,700	11,200	5,500	14,200	100	300	100	400
Psychology	54,700	20,700	34,000	43,300	3,300	1,900	600	2,400
Social sciences	112,400	63,800	48,500	97,700	5,400	1,800	600	3,800
Economics	39,000	25,100	13,900	35,500	1,000	700	(4)	1,200
Sociology/anthropology	24,700	9,200	15,500	20,300	1,900	500	200	1,000
Other social sciences	48,600	29,500	19,100	42,000	2,400	500	400	1,600
Engineering, total	138,600	119,700	18,900	115,400	4,900	7,100	700	4,600
Aero/astro	6,200	5,600	600	5,500	100	200	(4)	200
Chemical	8,500	6,100	2,400	7,400	200	400	0	200
Civil	15,200	13,000	2,200	12,700	500	700	100	400
Elect/electron	47,800	43,100	4,700	38,400	1,800	3,300	300	1,800
Industrial	12,200	9,400	2,800	10,200	600	300	100	400
Materials	1,700	1,300	500	1,500	0	100	(4)	0
Mechanical	29,100	26,200	2,800	25,100	800	1,400	0	600
Mining	1,200	1,200	100	1,100	(4)	(4)	(4)	(4)
Nuclear	500	400	100	500	0	0	0	0
Petroleum	1,800	1,600	200	1,500	0	0	0	100
Other engineering	14,300	11,700	2,600	11,600	800	600	100	900

See footnotes at end of table.

Table 5. - continued

Field of degree	Master's Recipients (3)							
	Total (1)	Men	Women	White	Black	Asian	Native American	Hispanic (2)
Total, all fields	86,500	62,000	24,500	67,600	2,600	7,700	300	2,600
Sciences, total	59,100	38,200	20,900	46,900	2,000	4,400	100	1,900
Physical sciences	3,700	2,600	1,100	3,100	200	200	(4)	100
Chemistry	1,800	1,100	600	1,400	200	100	(4)	0
Physics/astronomy	1,000	900	100	800	0	100	(4)	0
Other physical sciences	900	600	300	800	0	0	(4)	0
Math/Statistics	6,900	4,700	2,200	5,400	200	500	(4)	200
Computer science	19,900	14,100	5,800	15,200	500	2,600	(4)	700
Environmental science	3,000	2,300	700	2,700	0	0	0	0
Life sciences	11,100	6,400	4,700	8,900	400	400	0	600
Biology	6,800	3,300	3,500	5,400	300	300	0	400
Agricultural sciences	4,300	3,100	1,200	3,500	200	100	(4)	100
Psychology	4,000	1,700	2,300	3,400	300	0	100	(4)
Social sciences	10,600	6,500	4,100	8,200	400	600	0	400
Economics	2,500	2,100	400	1,600	200	200	(4)	300
Sociology/anthropology	1,700	900	800	1,500	100	(4)	(4)	(4)
Other social sciences	6,400	3,500	2,900	5,100	200	400	0	100
Engineering, total	27,300	23,800	3,600	20,700	500	3,300	200	700
Aero/astro	1,200	1,100	100	900	0	0	(4)	0
Chemical	1,500	1,300	300	1,200	0	200	0	0
Civil	4,000	3,400	600	3,000	100	500	0	200
Elect/electron	8,000	7,400	600	5,700	100	1,300	(4)	200
Industrial	1,500	1,200	300	1,100	100	200	(4)	100
Materials	800	600	200	600	0	100	(4)	0
Mechanical	4,300	3,800	500	3,400	0	500	100	100
Mining	400	400	0	300	0	0	(4)	0
Nuclear	300	300	0	200	(4)	0	(4)	0
Petroleum	300	300	0	200	0	0	0	0
Other engineering	5,000	4,000	900	4,000	100	500	0	100

(1) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Graduates who received their degrees in either academic year 1986 or 1987.
(4) Too few cases to estimate.

NOTE: Detail may not add to total because of rounding.
SOURCE: National Science Foundation, SRS.

Table 6. Selected characteristics of persons with physical disabilities who are scientists and engineers: 1986

Field	Total population	Visual	Auditory	Ambulatory	Other
Total, all fields	94,200	21,100	16,500	20,500	36,100
Scientists, total	40,400	9,700	7,600	9,800	13,400
Physical scientists	7,600	2,500	1,100	1,400	2,600
Mathematical scientists	1,600	300	400	500	500
Computer specialists	9,200	1,800	2,700	3,000	1,700
Environmental scientists	3,000	200	400	1,300	1,100
Life scientists	6,300	1,300	1,200	1,700	2,100
Psychologists	6,100	1,100	1,400	1,200	2,400
Social scientists	6,600	2,600	400	700	2,900
Engineers, total	53,800	11,400	8,900	10,800	22,700

Field	Labor force status			
	Total population	Labor Force	Total Employed	Unemployed
Total, all fields	94,200	71,400	70,300	1,100
Scientists, total	40,400	34,500	34,200	300
Physical scientists	7,600	5,300	5,300	(1)
Mathematical scientists	1,600	1,600	1,500	100
Computer specialists	9,200	9,100	9,100	(1)
Environmental scientists	3,000	2,000	2,000	(1)
Life scientists	6,300	5,700	5,600	100
Psychologists	6,100	5,400	5,400	(1)
Social scientists	6,600	5,500	5,300	100
Engineers, total	53,800	36,900	36,100	800

Table 6.- continued

Field	Reason Outside Labor Force			
	Total Outside Labor Force	Retired	Illness	Other
Total, all fields	22,900	16,400	5,300	1,200
Scientists, total	5,900	4,100	1,000	800
Physical scientists	2,400	1,600	800	(1)
Mathematical scientists	100	(1)	(1)	100
Computer specialists	100	(1)	100	(1)
Environmental scientists	1,000	900	100	(1)
Life scientists	600	400	100	100
Psychologists	700	400	(1)	300
Social scientists	1,200	1,000	(1)	200
Engineers, total	16,900	12,300	4,300	400

(1) Too few cases to estimate.

NOTE: Detail may not add to totals because of rounding.
SOURCE: National Science Foundation, SRS.

Table 7. Employed scientists and engineers, by field, racial/ethnic group, and years of professional experience: 1986

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Total, all fields (1)	4,626,500	104,200	584,200	726,700	680,900	625,800	526,500	459,600	359,200	417,400
White	4,190,400	91,600	522,800	646,500	607,200	564,900	469,300	419,700	338,100	402,100
Black	114,900	2,600	18,800	21,700	23,400	14,100	12,600	7,600	5,600	3,100
Asian	226,800	7,500	25,800	38,200	38,400	35,000	32,300	24,500	12,500	7,300
Native American	23,600	300	1,600	2,700	2,400	2,500	5,600	2,900	1,500	3,300
Hispanic (2)	93,400	3,000	18,900	19,500	13,900	13,200	7,800	6,400	3,900	3,800
Scientists, total	2,186,300	73,600	367,700	412,600	354,300	307,400	227,600	155,900	117,200	111,400
White	1,973,100	65,600	328,300	366,400	317,600	280,900	205,500	139,700	109,300	107,100
Black	73,700	1,800	14,400	14,900	15,100	8,800	7,000	4,800	3,200	800
Asian	94,000	4,500	15,100	19,800	15,900	12,400	9,800	9,000	3,800	2,100
Native American	10,300	(3)	1,200	1,600	600	400	3,200	1,200	700	1,200
Hispanic	46,100	2,000	13,100	10,000	6,400	7,300	2,900	1,500	1,500	600
Physical scientists	288,400	7,400	29,500	33,400	36,700	39,100	40,900	37,500	25,300	31,100
White	261,800	6,800	26,900	29,700	32,400	34,500	36,800	33,700	23,900	30,200
Black	6,200	200	1,200	700	500	1,000	800	900	600	100
Asian	15,400	300	900	2,200	2,200	3,100	2,800	2,300	700	500
Native American	1,000	(3)	(3)	100	(3)	(3)	400	300	(3)	200
Hispanic	4,800	(3)	700	300	700	1,000	600	700	500	200
Mathematical scientists	131,000	2,400	17,100	18,200	17,300	23,100	20,200	13,300	9,000	6,200
White	115,500	2,000	15,400	17,000	14,900	21,200	17,200	10,800	7,000	5,900
Black	6,800	200	300	600	1,300	600	1,300	1,700	600	200
Asian	5,900	200	900	400	500	500	1,300	600	1,300	(3)
Native American	200	(3)	100	(3)	(3)	(3)	(3)	100	(3)	(3)
Hispanic	3,100	(3)	800	500	400	1,200	100	100	(3)	(3)
Computer specialists	562,600	13,300	105,400	123,900	115,500	86,500	53,700	29,000	15,800	6,300
White	497,100	11,100	91,400	109,900	102,000	77,700	47,000	26,100	14,900	6,200
Black	18,900	400	3,600	3,500	3,900	2,900	1,900	500	700	100
Asian	36,100	1,500	7,400	8,100	8,900	4,600	2,900	1,900	200	(3)
Native American	2,200	(3)	200	200	100	100	1,400	(3)	(3)	(3)
Hispanic	9,300	400	3,000	2,600	1,000	900	900	100	200	(3)

Table 7. - continued

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Environmental scientists	111,300	3,600	16,500	21,500	18,200	10,100	8,200	11,700	8,100	10,300
White	105,800	3,400	15,800	20,200	16,600	9,600	7,800	11,300	7,700	10,200
Black	1,000	(3)	100	100	700	100	(3)	100	(3)	(3)
Asian	2,100	100	100	200	800	300	300	100	200	(3)
Native American	400	(3)	100	100	100	(3)	(3)	100	100	100
Hispanic	1,800	100	300	700	100	100	200	200	200	(3)
Life scientists	411,800	13,800	68,800	81,400	61,400	51,700	38,400	26,800	28,700	28,300
White	377,900	12,200	63,400	72,000	56,100	47,300	36,400	24,200	27,400	27,300
Black	8,800	100	1,000	2,400	2,300	1,200	500	400	400	200
Asian	15,000	1,000	2,400	3,500	2,300	2,400	1,300	1,600	300	200
Native American	2,800	(3)	200	700	200	(3)	100	500	500	600
Hispanic	9,900	700	2,900	2,400	1,200	1,200	300	300	500	400
Psychologists	253,500	8,800	38,300	50,100	44,900	39,000	28,500	16,500	12,600	8,200
White	234,100	8,200	36,100	43,600	40,600	36,900	27,100	15,400	12,200	7,900
Black	9,100	200	1,200	1,700	3,600	600	500	1,000	200	100
Asian	5,200	100	200	3,600	300	500	100	100	200	(3)
Native American	1,900	(3)	100	300	300	200	700	100	(3)	300
Hispanic	5,900	200	2,000	1,600	700	1,100	200	(3)	(3)	(3)
Social scientists	427,800	24,300	92,200	84,100	60,400	58,000	37,600	21,100	17,700	20,900
White	380,800	21,800	79,400	74,000	55,100	53,700	33,300	18,300	16,100	19,400
Black	22,900	700	6,900	5,900	2,800	2,500	2,100	200	600	100
Asian	14,200	1,400	3,100	1,700	1,000	1,000	1,100	2,400	900	1,300
Native American	1,700	(3)	500	400	100	(3)	400	100	100	100
Hispanic	11,400	600	3,200	1,900	2,200	1,800	600	100	100	(3)
Engineers, total	2,440,100	30,600	216,500	314,100	326,600	318,400	298,800	303,700	242,000	306,000
White	2,217,300	26,000	194,400	290,100	289,600	284,000	263,800	280,000	228,800	295,000
Black	41,300	800	4,500	6,800	8,300	5,300	5,700	2,800	2,400	2,300
Asian	132,800	3,000	10,700	18,400	22,500	22,600	22,500	15,600	8,700	5,200
Native American	13,300	200	400	1,100	1,800	2,100	2,500	1,700	800	2,100
Hispanic	47,200	1,100	5,800	9,500	7,500	5,900	4,900	4,900	2,400	3,200

(1) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 8. Employed men scientists and engineers, by field, racial/ethnic group, and years of professional experience: 1986

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Total, all fields (1)	3,927,800	72,000	396,200	541,700	561,300	557,900	491,100	441,600	346,300	403,800
White	3,581,500	63,200	358,300	487,200	502,700	504,300	437,900	404,600	326,400	389,800
Black	80,500	1,400	10,900	12,900	15,600	12,000	10,600	6,900	4,600	2,900
Asian	190,500	5,800	17,600	26,900	32,700	31,500	30,700	22,800	12,300	6,100
Native American	21,000	200	900	1,700	2,300	2,300	5,600	2,300	1,400	3,300
Hispanic (2)	73,800	2,300	10,700	14,000	11,600	11,800	7,200	6,200	3,900	3,800
Scientists, total	1,586,700	44,600	212,100	258,900	246,800	244,800	195,100	139,900	107,100	99,900
White	1,448,300	39,900	192,000	234,000	223,200	224,800	176,500	126,100	100,100	97,000
Black	43,600	800	7,400	7,400	7,500	7,000	4,900	4,100	2,400	600
Asian	65,000	3,100	8,700	10,400	11,600	9,200	8,600	7,900	3,600	900
Native American	7,900	(3)	600	700	600	200	3,200	700	700	1,200
Hispanic	29,800	1,300	6,000	5,700	4,500	6,000	2,400	1,400	1,500	500
Physical scientists	250,100	5,200	21,000	24,300	30,800	35,100	38,000	35,700	24,600	29,100
White	230,100	4,900	19,600	22,200	27,500	31,500	34,700	32,200	23,400	28,300
Black	4,500	100	600	600	300	800	500	900	600	100
Asian	11,200	200	500	1,000	1,400	2,400	2,300	2,000	600	500
Native American	1,000	(3)	(3)	100	(3)	(3)	400	300	(3)	200
Hispanic	3,900	(3)	500	200	600	800	400	700	500	200
Mathematical scientists	97,100	1,300	9,300	10,900	11,000	18,800	18,300	11,800	7,900	5,300
White	85,200	1,100	8,000	10,300	9,400	17,200	15,700	9,600	6,600	5,100
Black	4,500	(3)	200	300	700	400	1,100	1,500	100	(3)
Asian	5,100	200	800	200	400	300	1,200	600	1,300	(3)
Native American	100	(3)	(3)	(3)	(3)	(3)	(3)	100	(3)	(3)
Hispanic	1,900	(3)	200	200	100	1,200	100	100	(3)	(3)
Computer specialists	400,000	8,500	64,700	80,700	76,700	64,500	47,800	27,400	14,600	5,500
White	354,100	6,900	56,300	71,300	67,000	58,800	42,300	24,600	13,700	5,400
Black	11,700	200	2,100	1,900	2,300	2,000	800	500	700	100
Asian	27,300	1,200	5,000	5,800	7,100	3,200	2,700	1,700	200	(3)
Native American	1,800	(3)	(3)	100	100	100	1,400	(3)	(3)	(3)
Hispanic	6,400	300	1,600	2,000	1,000	200	900	100	200	(3)

See footnotes at end of table.

Table 8. - continued

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Environmental scientists	98,400	2,800	12,600	17,800	15,900	9,200	7,800	11,600	7,900	10,200
White	93,400	2,700	12,100	16,700	14,300	8,800	7,400	11,200	7,600	10,200
Black	900	(3)	100	100	600	100	(3)	(3)	(3)	(3)
Asian	2,000	100	100	100	800	300	300	100	200	(3)
Native American	400	(3)	100	(3)	(3)	(3)	(3)	100	100	100
Hispanic	1,700	100	200	700	100	100	100	200	200	(3)
Life scientists	309,000	8,300	36,400	54,800	48,400	43,900	33,400	22,200	26,600	26,400
White	288,900	7,200	34,600	50,000	45,200	40,600	31,700	20,700	25,300	25,300
Black	5,500	100	300	1,200	1,500	1,000	400	300	300	200
Asian	9,400	800	800	1,800	1,300	2,000	1,100	1,100	300	200
Native American	1,800	(3)	(3)	300	100	(3)	100	100	500	600
Hispanic	5,900	300	1,000	1,400	800	1,000	200	300	500	400
Psychologists	138,400	3,700	13,700	20,000	24,900	25,900	18,800	12,900	9,600	6,200
White	131,700	3,600	13,000	18,900	23,700	24,600	17,800	12,100	9,300	5,900
Black	3,100	(3)	400	700	800	300	200	700	100	(3)
Asian	800	(3)	(3)	100	100	200	(3)	100	200	(3)
Native American	1,400	(3)	100	(3)	300	(3)	700	100	(3)	300
Hispanic	2,700	(3)	800	500	500	800	200	(3)	(3)	(3)
Social scientists	293,800	15,000	54,400	50,400	39,100	47,400	31,000	18,300	15,700	17,200
White	265,000	13,600	48,500	44,600	36,200	43,300	26,900	15,700	14,200	16,800
Black	13,500	400	3,800	2,600	1,400	2,400	2,000	100	600	100
Asian	9,200	600	1,500	1,400	600	800	1,000	2,300	900	100
Native American	1,300	(3)	300	200	100	(3)	400	100	100	100
Hispanic	7,400	600	1,700	700	1,400	1,900	500	100	100	(3)
Engineers, total	2,341,100	27,300	184,100	282,700	314,500	313,100	296,000	301,600	239,300	303,800
White	2,133,200	23,300	166,300	253,200	279,500	279,500	261,400	278,500	226,300	292,800
Black	36,900	600	3,500	5,500	8,000	5,000	5,700	2,800	2,200	2,300
Asian	125,500	2,700	8,900	16,500	21,100	22,200	22,100	14,900	8,600	5,200
Native American	13,100	200	300	1,000	1,700	2,100	2,500	1,700	800	2,100
Hispanic	44,000	1,000	4,700	8,300	7,000	5,800	4,800	4,900	2,400	3,200

(1) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 9. Employed women scientists and engineers, by field, racial/ethnic group, and years of professional experience: 1986

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Total, all fields (1)	698,600	32,200	188,000	185,000	119,600	67,900	35,400	18,000	12,900	13,600
White	608,900	28,400	164,500	159,300	104,500	60,600	31,400	15,000	11,700	12,200
Black	34,500	1,200	7,900	8,700	7,900	2,100	2,100	700	1,000	200
Asian	36,300	1,800	8,200	11,300	5,700	3,500	1,700	1,700	200	1,200
Native American	2,700	100	700	1,000	100	200	(3)	500	(3)	(3)
Hispanic (2)	19,600	700	8,200	5,600	2,300	1,400	600	100	(3)	100
Scientists, total	599,600	29,000	155,600	153,700	107,500	62,600	32,500	15,900	10,100	11,500
White	524,800	25,700	136,300	132,400	94,400	56,000	29,000	13,600	9,200	10,100
Black	30,100	1,000	6,900	7,400	7,500	1,800	2,100	700	800	200
Asian	29,000	1,400	6,400	9,400	4,300	3,100	1,300	1,000	100	1,200
Native American	2,400	(3)	600	900	100	200	(3)	500	(3)	(3)
Hispanic	16,400	600	7,100	4,400	1,900	1,300	500	100	(3)	100
Physical scientists	38,300	2,200	8,400	9,100	5,900	3,900	2,900	1,700	700	2,000
White	31,700	2,000	7,300	7,500	4,900	2,900	2,100	1,400	500	1,900
Black	1,700	100	600	200	200	200	300	(3)	100	(3)
Asian	4,200	100	400	1,200	800	700	600	300	100	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	900	(3)	200	100	200	200	200	(3)	(3)	(3)
Mathematical scientists	33,900	1,100	7,800	7,200	6,300	4,300	1,900	1,500	1,000	900
White	30,300	900	7,300	6,700	5,500	4,000	1,600	1,200	400	700
Black	2,300	200	100	200	600	100	200	200	500	100
Asian	800	(3)	100	200	200	200	100	(3)	(3)	(3)
Native American	100	(3)	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	1,200	(3)	600	300	300	(3)	(3)	(3)	(3)	(3)
Computer specialists	162,500	4,900	40,600	43,200	38,800	22,000	5,900	1,600	1,200	800
White	143,000	4,200	35,100	38,600	35,000	18,900	4,600	1,500	1,200	800
Black	7,200	200	1,500	1,600	1,700	900	1,100	(3)	(3)	(3)
Asian	8,800	300	2,500	2,300	1,800	1,400	200	100	(3)	(3)
Native American	400	(3)	200	100	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	2,900	100	1,400	600	(3)	700	(3)	100	(3)	(3)

Table 9. - continued

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Environmental scientists	12,900	800	3,900	3,700	2,400	900	400	100	200	100
White	12,400	800	3,800	3,500	2,300	900	400	100	200	100
Black	100	(3)	(3)	(3)	100	(3)	(3)	(3)	(3)	(3)
Asian	200	(3)	(3)	100	(3)	(3)	(3)	(3)	(3)	(3)
Native American	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	200	(3)	100	(3)	(3)	(3)	100	(3)	(3)	(3)
Life scientists	102,800	5,600	32,400	26,600	13,000	7,800	5,000	4,500	2,100	2,000
White	89,100	5,000	28,800	22,100	10,900	6,700	4,700	3,500	2,000	2,000
Black	3,300	(3)	700	1,200	800	200	100	(3)	100	(3)
Asian	5,600	200	1,600	1,700	1,000	400	200	500	(3)	(3)
Native American	1,000	(3)	100	400	(3)	(3)	(3)	400	(3)	(3)
Hispanic	4,100	400	2,000	1,000	400	100	100	(3)	(3)	100
Psychologists	115,200	5,100	24,600	30,200	20,000	13,100	9,800	3,700	3,000	2,000
White	102,500	4,600	23,200	24,700	16,900	12,300	9,300	3,300	2,900	1,900
Black	6,000	200	800	1,000	2,800	300	400	300	100	100
Asian	4,400	100	200	3,600	200	300	100	(3)	(3)	(3)
Native American	500	(3)	(3)	300	(3)	200	(3)	(3)	(3)	(3)
Hispanic	3,100	100	1,200	1,200	300	300	100	(3)	(3)	(3)
Social scientists	134,000	9,400	37,700	33,700	21,200	10,600	6,600	2,800	2,000	3,800
White	115,800	8,200	30,900	29,400	19,000	10,400	6,300	2,600	1,900	2,600
Black	9,400	300	3,100	3,300	1,400	100	100	100	100	(3)
Asian	5,000	800	1,700	300	400	200	100	100	(3)	1,200
Native American	400	(3)	200	100	(3)	(3)	(3)	100	(3)	(3)
Hispanic	4,000	(3)	1,600	1,200	800	(3)	100	(3)	(3)	(3)
Engineers, total	99,000	3,300	32,500	31,300	12,100	5,300	2,900	2,100	2,800	2,200
White	84,100	2,700	28,200	26,900	10,100	4,600	2,400	1,400	2,500	2,200
Black	4,400	100	1,000	1,300	300	300	(3)	(3)	100	(3)
Asian	7,300	300	1,900	1,900	1,400	400	400	700	100	(3)
Native American	300	(3)	100	100	100	(3)	(3)	(3)	(3)	(3)
Hispanic	3,200	100	1,100	1,200	400	100	100	(3)	(3)	(3)

(1) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 10. Employed doctoral scientists and engineers, by field, racial/ethnic group, and years of professional experience: 1987

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Total, all fields (1)	419,100	13,100	54,800	81,900	79,600	77,400	48,300	26,200	19,800	11,100
White	373,000	11,200	47,100	70,700	69,800	70,100	44,100	24,600	18,700	10,700
Black	6,400	300	1,300	1,800	1,500	900	200	200	200	(3)
Asian	36,400	1,500	5,900	8,900	7,800	5,600	3,700	1,400	800	300
Native American	500	(3)	200	100	100	100	100	(3)	(3)	(3)
Hispanic (2)	6,900	400	1,400	1,600	1,300	1,000	600	200	200	100
Scientists, Total	351,300	11,300	47,500	70,700	67,100	61,700	39,200	22,200	17,100	9,100
White	319,000	9,900	42,000	63,000	60,500	56,700	36,000	20,900	16,100	8,800
Black	5,700	300	1,100	1,400	1,300	900	200	200	200	(3)
Asian	23,600	1,000	3,900	5,700	4,700	3,800	2,700	1,000	700	200
Native American	500	(3)	100	100	100	100	100	(3)	(3)	(3)
Hispanic	5,900	400	1,200	1,400	1,100	800	400	200	200	100
Physical scientists	68,600	1,600	7,900	10,700	10,700	13,000	10,400	6,000	4,800	2,900
White	60,800	1,300	6,300	9,000	9,400	11,800	9,400	5,700	4,500	2,900
Black	600	(3)	200	100	100	100	(3)	(3)	(3)	(3)
Asian	6,800	200	1,300	1,600	1,100	1,000	1,000	200	300	(3)
Native American	100	(3)	(3)	(3)	(3)	100	(3)	(3)	(3)	(3)
Hispanic	1,000	100	200	200	200	300	100	(3)	(3)	(3)
Mathematical scientists	16,600	400	1,800	2,700	2,900	3,700	2,600	1,100	600	500
White	14,900	300	1,500	2,400	2,600	3,500	2,400	1,000	600	400
Black	200	(3)	(3)	(3)	(3)	100	(3)	(3)	(3)	(3)
Asian	1,500	100	300	300	300	100	200	100	(3)	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	300	(3)	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Computer specialists	18,600	600	2,400	4,300	4,100	3,700	1,700	800	500	200
White	16,200	600	1,900	3,600	3,600	3,400	1,600	700	500	200
Black	200	(3)	(3)	(3)	100	100	(3)	(3)	(3)	(3)
Asian	1,800	100	400	700	400	200	100	100	(3)	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	300	(3)	100	100	(3)	(3)	(3)	(3)	(3)	(3)
Environmental scientists	17,800	500	2,100	3,400	3,800	3,200	2,200	1,200	800	400
White	16,600	400	1,800	3,100	3,500	3,000	2,000	1,200	800	400
Black	200	(3)	100	100	(3)	(3)	(3)	(3)	(3)	(3)
Asian	900	(3)	200	200	200	100	100	(3)	100	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	300	(3)	100	(3)	100	(3)	(3)	(3)	(3)	(3)

Table 10. - continued

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Life scientists	107,400	3,900	15,700	22,000	20,400	18,100	10,500	6,800	5,500	2,800
White	97,000	3,500	14,100	19,800	18,100	16,200	9,500	6,300	5,200	2,700
Black	1,500	100	300	300	400	200	(3)	(3)	(3)	(3)
Asian	8,200	300	1,100	1,900	1,800	1,400	800	400	200	100
Native American	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	1,600	100	300	300	300	200	200	100	(3)	(3)
Psychologists	56,400	2,200	9,300	13,700	10,900	8,200	5,100	3,000	2,300	900
White	53,700	2,000	8,700	12,800	10,400	7,900	5,000	2,900	2,100	800
Black	1,300	100	200	400	300	100	(3)	(3)	100	(3)
Asian	900	(3)	200	300	100	100	100	(3)	(3)	(3)
Native American	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	1,000	100	300	300	200	(3)	(3)	(3)	(3)	(3)
Social scientists	65,900	2,100	8,400	13,800	14,200	11,900	6,700	3,300	2,500	1,500
White	60,000	1,900	7,700	12,300	13,000	11,000	6,100	3,000	2,500	1,400
Black	1,800	100	300	500	400	300	100	100	(3)	(3)
Asian	3,500	100	400	900	700	500	400	200	100	(3)
Native American	100	(3)	(3)	(3)	(3)	(3)	100	(3)	(3)	(3)
Hispanic	1,400	100	300	400	300	200	(3)	(3)	100	(3)
Engineers, total	67,800	1,800	7,400	11,300	12,600	15,600	9,100	4,100	2,800	2,000
White	53,900	1,200	5,100	7,700	9,300	13,400	8,100	3,700	2,600	1,900
Black	700	(3)	200	300	100	(3)	(3)	(3)	(3)	(3)
Asian	12,800	500	2,000	3,200	3,100	2,100	1,000	400	200	100
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	1,100	100	100	200	200	200	100	100	(3)	(3)

(1) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 11. Employed doctoral men scientists and engineers, by field, racial/ethnic group, and years of professional experience: 1987

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Total, all fields (1)	352,400	8,900	39,200	62,200	67,100	70,300	45,100	24,700	19,100	10,600
White	313,000	7,400	33,100	53,000	58,600	63,700	41,200	23,200	18,000	10,300
Black	4,400	100	700	1,100	1,100	800	100	200	200	(3)
Asian	32,000	1,200	4,900	7,600	6,900	5,200	3,500	1,300	800	200
Native American	400	(3)	100	(3)	100	100	100	(3)	(3)	(3)
Hispanic (2)	5,700	300	900	1,300	1,100	900	500	200	200	100
Scientists, total	286,300	7,200	32,300	51,500	54,900	54,800	36,000	20,700	16,300	8,600
White	260,400	6,300	28,300	45,700	49,600	50,300	33,100	19,500	15,400	8,400
Black	3,800	100	600	800	900	800	100	200	200	(3)
Asian	19,600	700	3,000	4,500	3,900	3,200	2,500	900	600	100
Native American	400	(3)	100	(3)	100	100	100	(3)	(3)	(3)
Hispanic	4,700	300	800	1,100	1,000	700	400	200	200	100
Physical scientists	63,200	1,200	6,700	9,300	9,700	12,400	10,100	5,700	4,700	2,800
White	56,300	1,000	5,400	7,800	8,600	11,300	9,100	5,500	4,300	2,800
Black	500	(3)	200	100	100	100	(3)	(3)	(3)	(3)
Asian	5,900	200	1,100	1,300	1,000	900	900	200	300	(3)
Native American	100	(3)	(3)	(3)	(3)	100	(3)	(3)	(3)	(3)
Hispanic	900	100	100	100	200	300	100	(3)	(3)	(3)
Mathematical scientists	15,000	300	1,500	2,300	2,600	3,500	2,500	1,100	600	400
White	13,500	200	1,200	2,000	2,400	3,300	2,200	1,000	600	400
Black	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Asian	1,300	100	300	200	200	100	200	100	(3)	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	200	(3)	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Computer specialists	16,700	500	2,000	3,600	3,700	3,500	1,700	700	500	200
White	14,600	500	1,600	2,900	3,300	3,200	1,600	700	500	200
Black	200	(3)	(3)	(3)	100	100	(3)	(3)	(3)	(3)
Asian	1,600	(3)	300	600	400	200	100	100	(3)	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	300	(3)	100	100	(3)	(3)	(3)	(3)	(3)	(3)
Environmental scientists	16,500	400	1,700	3,000	3,500	3,100	2,100	1,200	800	400
White	15,400	300	1,500	2,800	3,300	2,900	2,000	1,200	700	400
Black	200	(3)	100	100	(3)	(3)	(3)	(3)	(3)	(3)
Asian	800	(3)	100	200	200	100	100	(3)	100	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	300	(3)	(3)	(3)	100	(3)	(3)	(3)	(3)	(3)

Table 11. - continued

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Life scientists	85,300	2,400	10,400	15,800	16,400	15,700	9,500	6,200	5,100	2,600
White	77,300	2,100	9,400	14,200	14,600	14,000	8,700	5,800	4,900	2,600
Black	900	100	100	200	300	200	(3)	(3)	(3)	(3)
Asian	6,400	200	700	1,400	1,400	1,200	700	400	200	100
Native American	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	1,200	100	200	300	200	200	200	100	(3)	(3)
Psychologists	37,300	1,200	4,600	7,800	7,400	6,200	4,100	2,700	2,100	700
White	35,800	1,100	4,400	7,300	7,100	6,000	4,000	2,600	2,000	700
Black	600	(3)	100	100	100	100	(3)	(3)	100	(3)
Asian	500	(3)	100	100	100	100	100	(3)	(3)	(3)
Native American	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	600	(3)	100	200	200	(3)	(3)	(3)	(3)	(3)
Social scientists	52,400	1,200	5,400	9,800	11,500	10,500	6,100	3,100	2,400	1,400
White	47,600	1,000	4,900	8,700	10,400	9,600	5,500	2,800	2,300	1,300
Black	1,200	(3)	100	300	300	300	100	100	(3)	(3)
Asian	3,000	100	300	700	600	500	400	200	100	(3)
Native American	100	(3)	(3)	(3)	(3)	(3)	100	(3)	(3)	(3)
Hispanic	1,100	100	200	400	200	100	(3)	(3)	100	(3)
Engineers, total	66,100	1,700	6,900	10,700	12,200	15,500	9,100	4,100	2,800	2,000
White	52,600	1,100	4,800	7,300	9,000	13,300	8,100	3,700	2,600	1,900
Black	600	(3)	200	300	100	(3)	(3)	(3)	(3)	(3)
Asian	12,400	500	1,900	3,100	3,000	2,000	1,000	400	200	100
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	1,100	100	100	200	200	200	100	100	(3)	(3)

(1) Detail will not add to total employed because
  a) racial and ethnic categories are not mutually exclusive and
  b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 12. Employed doctoral women scientists and engineers, by field, racial/ethnic group, and years of professional experience: 1987

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Total, all fields (1)	66,700	4,200	15,700	19,700	12,500	7,100	3,200	1,500	800	500
White	60,000	3,700	14,000	17,700	11,200	6,500	2,900	1,400	800	400
Black	1,900	100	500	600	400	100	(3)	(3)	(3)	(3)
Asian	4,400	300	1,000	1,300	900	400	200	100	(3)	100
Native American	100	(3)	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic (2)	1,200	100	400	300	200	100	(3)	(3)	(3)	(3)
Scientists, total	65,000	4,100	15,200	19,100	12,200	7,000	3,200	1,500	800	500
White	58,600	3,600	13,700	17,300	10,900	6,400	2,900	1,400	800	400
Black	1,900	100	500	600	400	100	(3)	(3)	(3)	(3)
Asian	4,100	300	900	1,200	800	400	200	100	(3)	100
Native American	100	(3)	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	1,200	100	400	300	200	100	(3)	(3)	(3)	(3)
Physical scientists	5,500	300	1,200	1,500	1,000	600	400	200	100	100
White	4,500	200	1,000	1,200	800	500	300	200	100	100
Black	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Asian	900	100	200	300	200	100	[illegible]	(3)	(3)	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	100	(3)	(3)	100	(3)	(3)	(3)	(3)	(3)	(3)
Mathematical scientists	1,600	100	300	400	300	200	100	100	(3)	(3)
White	1,400	100	300	400	300	200	100	(3)	(3)	(3)
Black	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Asian	200	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Computer specialists	1,900	100	400	700	400	200	(3)	(3)	(3)	(3)
White	1,700	100	300	700	400	100	(3)	(3)	(3)	(3)
Black	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Asian	200	(3)	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Environmental scientists	1,300	100	300	400	200	100	100	(3)	(3)	(3)
White	1,200	100	300	400	200	100	100	(3)	(3)	(3)
Black	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Asian	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)

Table 12. - continued

Field and racial/ethnic group	Total Employed (1)	Professional Experience								
		1 or less	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35 and over
Life scientists	22,100	1,600	5,300	6,200	4,000	2,400	1,000	600	300	200
White	19,600	1,400	4,700	5,600	3,500	2,200	800	600	300	100
Black	500	(3)	200	100	100	(3)	(3)	(3)	(3)	(3)
Asian	1,800	100	400	500	400	200	100	100	(3)	100
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	300	(3)	100	100	(3)	(3)	(3)	(3)	(3)	(3)
Psychologists	19,100	1,100	4,600	5,900	3,500	2,000	1,000	300	200	100
White	17,900	1,000	4,400	5,500	3,300	1,900	900	300	200	100
Black	700	100	200	200	100	100	(3)	(3)	(3)	(3)
Asian	400	(3)	100	200	(3)	(3)	(3)	(3)	(3)	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	400	(3)	100	100	100	(3)	(3)	(3)	(3)	(3)
Social scientists	13,500	1,000	3,000	4,000	2,700	1,400	600	200	100	100
White	12,400	900	2,800	3,600	2,500	1,400	600	200	100	100
Black	600	(3)	200	200	100	(3)	(3)	(3)	(3)	(3)
Asian	500	(3)	100	100	100	(3)	(3)	(3)	(3)	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	300	(3)	100	100	100	(3)	(3)	(3)	(3)	(3)
Engineers, total	1,700	200	400	600	400	100	(3)	(3)	(3)	(3)
White	1,300	100	300	400	300	100	(3)	(3)	(3)	(3)
Black	100	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Asian	300	(3)	100	100	100	(3)	(3)	(3)	(3)	(3)
Native American	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)

(1) Detail will not add to total employed because
  a) racial and ethnic categories are not mutually exclusive and
  b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 13. Employed scientists and engineers, by field, racial/ethnic group, and selected primary work activity: 1986

Field and racial/ethnic group	Total Employed (1)	Research	Development	Management of R&D	General management
Total, all fields (2)	4,626,500	393,500	875,500	398,600	883,600
White	4,190,400	355,000	780,800	366,800	810,600
Black	114,900	6,800	15,400	7,300	25,700
Asian	226,800	23,300	60,800	17,500	32,100
Native American	23,600	1,200	3,700	2,500	4,600
Hispanic (3)	93,400	8,100	15,300	6,300	17,700
Scientists, total	2,186,300	291,500	182,200	162,600	383,000
White	1,973,100	263,900	161,400	148,200	345,300
Black	73,700	5,700	3,800	3,800	18,600
Asian	94,000	15,900	13,400	6,200	12,800
Native American	10,300	900	200	1,700	1,800
Hispanic	46,100	5,700	3,300	3,100	8,800
Physical scientists	288,400	70,500	44,700	43,000	30,500
White	261,800	62,600	39,800	39,400	28,800
Black	6,200	1,500	1,000	600	900
Asian	15,400	4,900	3,400	1,400	400
Native American	1,000	400	(4)	700	(4)
Hispanic	4,800	1,700	900	500	700
Mathematical scientists	131,000	12,000	6,000	14,700	21,000
White	115,500	11,200	5,500	13,500	18,800
Black	6,800	200	300	700	900
Asian	5,900	400	100	200	300
Native American	200	(4)	(4)	(4)	100
Hispanic	3,100	100	100	(4)	800
Computer specialists	562,600	15,000	97,800	32,800	54,000
White	497,100	12,400	85,500	29,800	47,000
Black	18,900	200	1,800	700	3,600
Asian	36,100	2,200	8,500	1,900	2,800
Native American	2,200	(4)	(4)	200	400
Hispanic	9,300	100	1,300	300	800

Table 13. - continued

Field and racial/ethnic group	Total Employed (1)	Research	Development	Management of R&D	General management
Environmental scientists	111,300	29,900	6,400	7,500	14,300
White	105,800	28,300	6,200	7,200	13,400
Black	1,000	100	(4)	(4)	600
Asian	2,100	1,100	200	(4)	100
Native American	400	100	(4)	100	(4)
Hispanic	1,800	300	100	(4)	200
Life scientists	411,800	112,700	15,700	30,100	80,100
White	377,900	101,700	14,000	27,100	74,500
Black	8,800	2,700	300	600	2,200
Asian	15,000	5,700	1,000	1,700	1,500
Native American	2,800	200	(4)	700	1,000
Hispanic	9,900	3,100	300	600	1,700
Psychologists	253,500	17,400	3,200	9,500	56,500
White	234,100	16,300	3,000	8,800	50,400
Black	9,100	500	(4)	500	2,300
Asian	5,200	300	(4)	200	3,500
Native American	1,900	(4)	(4)	(4)	(4)
Hispanic	5,900	300	(4)	(4)	1,100
Social scientists	427,800	33,800	8,500	25,200	126,600
White	380,800	31,300	7,400	22,400	112,300
Black	22,900	500	300	900	8,100
Asian	14,200	1,300	100	800	4,300
Native American	1,700	200	(4)	(4)	200
Hispanic	11,400	100	400	1,700	3,400
Engineers, total	2,440,100	102,000	693,200	236,000	500,600
White	2,217,300	91,100	629,400	218,700	465,400
Black	41,300	1,100	11,700	3,500	7,100
Asian	132,800	7,500	47,400	11,400	19,300
Native American	13,300	200	3,500	800	2,800
Hispanic	47,200	2,400	12,000	3,200	9,000

Table 13. - continued

Field and racial/ethnic group	Teaching	Production/ inspection	Reporting, statistical work, and computing
Total, all fields (2)	357,800	582,600	472,800
White	325,100	526,000	422,900
Black	10,800	15,000	15,200
Asian	16,900	27,700	25,400
Native American	700	3,900	1,800
Hispanic (3)	7,400	13,700	10,300
Scientists, total	300,800	159,000	359,600
White	274,300	140,200	322,000
Black	10,200	5,300	12,100
Asian	12,300	8,200	19,000
Native American	700	1,500	1,200
Hispanic	6,200	3,300	7,400
Physical scientists	45,800	32,200	6,900
White	43,700	27,300	6,500
Black	400	1,200	200
Asian	1,400	3,400	100
Native American	(4)	(4)	(4)
Hispanic	300	300	300
Mathematical scientists	46,600	5,100	16,500
White	38,900	4,200	14,800
Black	3,400	400	700
Asian	3,300	500	800
Native American	100	(4)	(4)
Hispanic	1,400	(4)	300
Computer specialists	19,600	20,500	271,300
White	17,600	16,800	241,400
Black	200	1,400	9,000
Asian	1,200	1,900	15,900
Native American	(4)	(4)	1,200
Hispanic	400	200	5,100

Table 13. - continued

Field and racial/ethnic group	Teaching	Production/ inspection	Reporting, statistical work, and computing
Environmental scientists	9,200	23,800	6,800
White	8,800	22,300	6,500
Black	(4)	100	100
Asian	200	300	200
Native American	100	100	(4)
Hispanic	400	400	100
Life scientists	61,500	44,000	13,300
White	57,900	40,700	12,000
Black	1,400	500	400
Asian	1,600	1,600	100
Native American	200	300	(4)
Hispanic	800	1,200	200
Psychologists	39,100	11,000	5,300
White	37,200	9,000	4,900
Black	1,100	500	200
Asian	200	(4)	200
Native American	300	500	(4)
Hispanic	600	1,000	200
Social scientists	79,000	22,500	39,500
White	70,200	19,900	36,000
Black	3,800	1,200	1,400
Asian	4,300	600	1,700
Native American	100	600	(4)
Hispanic	2,300	200	1,200
Engineers, total	56,900	423,600	113,200
White	50,800	385,700	100,800
Black	600	9,700	3,200
Asian	4,600	19,500	6,400
Native American	(4)	2,500	600
Hispanic	1,100	10,400	2,900

(1) Includes consulting, other, and no report.
(2) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(3) Includes members of all racial groups.
(4) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 14. Employed men scientists and engineers, by field, racial/ethnic group, and selected primary work activity: 1986

Field and racial/ethnic group	Total Employed (1)	Research	Development	Management of R&D	General management
Total, all fields (2)	3,927,800	314,400	802,300	367,200	781,100
White	3,581,500	285,200	717,800	339,300	724,000
Black	80,500	4,200	13,500	5,300	19,300
Asian	190,500	18,600	55,600	15,800	25,800
Native American	21,000	1,000	3,600	2,500	3,700
Hispanic (3)	73,800	5,800	13,200	6,100	14,800
Scientists, total	1,586,700	221,300	141,300	135,500	289,400
White	1,448,300	202,200	126,200	124,000	266,200
Black	43,600	3,100	2,600	1,900	12,700
Asian	65,000	11,600	10,400	5,200	7,100
Native American	7,900	800	100	1,700	1,000
Hispanic	29,800	3,700	2,200	3,000	6,200
Physical scientists	250,100	60,900	39,700	40,900	27,300
White	230,100	54,400	36,000	37,500	25,900
Black	4,500	1,200	600	500	900
Asian	11,200	4,000	2,600	1,300	200
Native American	1,000	400	(4)	700	(4)
Hispanic	3,900	1,500	700	400	700
Mathematical scientists	97,100	10,400	4,700	12,200	16,300
White	85,200	9,700	4,400	11,600	14,300
Black	4,500	100	200	100	800
Asian	5,100	300	100	100	300
Native American	100	(4)	(4)	(4)	(4)
Hispanic	1,900	100	100	(4)	800
Computer specialists	400,000	11,200	72,400	27,200	43,300
White	354,100	8,900	63,600	24,700	37,800
Black	11,700	100	1,200	500	2,600
Asian	27,300	2,000	6,900	1,700	2,500
Native American	1,800	(4)	(4)	200	400
Hispanic	6,400	100	600	200	700

Table 14. - continued

Field and racial/ethnic group	Total Employed (1)	Research	Development	Management of R&D	General management
Environmental scientists	98,400	25,600	5,600	7,000	13,000
White	93,400	24,100	5,500	6,700	12,000
Black	900	100	(4)	(4)	600
Asian	2,000	1,000	100	(4)	100
Native American	400	100	(4)	100	(4)
Hispanic	1,700	200	100	(4)	200
Life scientists	309,000	80,400	10,600	26,100	67,200
White	288,900	74,100	9,500	23,300	63,600
Black	5,500	1,300	300	400	1,600
Asian	9,400	3,300	600	1,700	1,000
Native American	1,800	200	(4)	700	500
Hispanic	5,900	1,700	300	500	1,200
Psychologists	138,400	9,900	1,500	5,100	32,100
White	131,700	9,600	1,500	4,800	30,700
Black	3,100	100	(4)	200	1,200
Asian	800	(4)	(4)	100	200
Native American	1,400	(4)	(4)	(4)	(4)
Hispanic	2,700	(4)	(4)	(4)	600
Social scientists	293,800	23,000	6,700	17,100	90,200
White	265,000	21,200	5,900	15,400	81,800
Black	13,500	300	300	300	5,100
Asian	9,200	900	100	300	2,800
Native American	1,300	100	(4)	(4)	100
Hispanic	7,400	100	400	1,700	2,100
Engineers, total	2,341,100	93,100	661,000	231,700	491,700
White	2,133,200	83,000	591,500	215,300	457,800
Black	36,900	1,000	10,800	3,400	6,600
Asian	125,500	6,900	45,200	10,600	18,700
Native American	13,100	200	3,500	800	2,700
Hispanic	44,000	2,100	11,000	3,200	8,600

Table 14. - continued

Field and racial/ethnic group	Teaching	Production/ inspection	Reporting, statistical work, and computing
Total, all fields (2)	276,300	529,000	341,100
White	251,500	480,900	308,500
Black	8,000	11,600	8,100
Asian	14,300	24,000	17,200
Native American	500	3,900	1,600
Hispanic (3)	3,900	12,200	7,900
Scientists, total	223,300	124,400	237,200
White	203,900	111,500	214,800
Black	7,400	3,000	6,300
Asian	10,200	5,600	11,500
Native American	400	1,400	1,100
Hispanic	2,800	2,500	5,200
Physical scientists	39,000	24,100	5,700
White	37,300	21,600	5,500
Black	300	700	200
Asian	1,300	1,500	(4)
Native American	(4)	(4)	(4)
Hispanic	100	200	300
Mathematical scientists	33,800	3,500	10,900
White	27,300	3,100	9,800
Black	2,700	(4)	400
Asian	3,100	400	600
Native American	100	(4)	(4)
Hispanic	700	(4)	100
Computer specialists	12,800	15,900	180,700
White	11,500	12,700	161,900
Black	(4)	1,100	4,500
Asian	1,100	1,700	10,300
Native American	(4)	(4)	1,100
Hispanic	100	200	3,800

Table 14. - continued

Field and racial/ethnic group	Teaching	Production/ inspection	Reporting, statistical work, and computing
Environmental scientists	8,300	21,900	5,700
White	8,000	20,600	5,500
Black	(4)	100	100
Asian	200	300	200
Native American	100	100	(4)
Hispanic	400	300	100
Life scientists	46,700	34,700	8,800
White	44,400	32,500	8,200
Black	1,000	200	300
Asian	1,000	1,200	100
Native American	200	200	(4)
Hispanic	400	700	100
Psychologists	25,900	7,600	2,000
White	25,100	5,900	2,000
Black	600	300	(4)
Asian	200	(4)	(4)
Native American	(4)	600	(4)
Hispanic	200	800	(4)
Social scientists	56,800	16,700	23,500
White	50,300	15,100	21,900
Black	2,800	600	900
Asian	3,500	500	400
Native American	100	600	(4)
Hispanic	900	200	800
Engineers, total	53,000	404,600	103,900
White	47,600	369,400	93,700
Black	600	8,600	1,800
Asian	4,100	18,400	5,700
Native American	(4)	2,500	400
Hispanic	1,100	9,700	2,700

(1) Includes consulting, other, and no report.
(2) Detail will not add to total employed because
  a) racial and ethnic categories are not mutually exclusive and
  b) total employed includes other and no report.
(3) Includes members of all racial groups.
(4) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 15. Employed women scientists and engineers, by field, racial/ethnic group, and selected primary work activity: 1986

Field and racial/ethnic group	Total Employed (1)	Research	Development	Management of R&D	General management
Total, all fields (2)	698,600	79,000	73,200	31,400	[illegible]2,500
White	608,900	69,900	63,000	27,500	86,600
Black	34,500	2,600	2,000	2,000	6,400
Asian	36,300	4,800	5,200	1,700	6,300
Native American	2,700	200	100	(4)	900
Hispanic (3)	19,600	2,200	2,100	200	2,900
Scientists, total	599,600	70,200	41,000	27,000	93,600
White	524,800	61,800	35,200	24,100	79,100
Black	30,100	2,600	1,100	1,900	5,800
Asian	29,000	4,200	3,000	1,000	5,800
Native American	2,400	200	(4)	(4)	900
Hispanic	16,400	2,000	1,100	100	2,600
Physical scientists	38,300	9,700	5,100	2,100	3,100
White	31,700	8,200	3,800	1,900	2,900
Black	1,700	400	400	100	100
Asian	4,200	900	800	100	200
Native American	(4)	(4)	(4)	(4)	(4)
Hispanic	900	200	200	100	(4)
Mathematical scientists	33,900	1,600	1,300	2,500	4,700
White	30,300	1,500	1,200	1,900	4,500
Black	2,300	100	100	500	100
Asian	800	100	(4)	100	(4)
Native American	100	(4)	(4)	(4)	100
Hispanic	1,200	(4)	(4)	(4)	(4)
Computer specialists	162,500	3,800	25,400	5,600	10,600
White	143,000	3,500	21,900	5,100	9,300
Black	7,200	(4)	600	200	1,000
Asian	8,800	200	1,600	200	300
Native American	400	(4)	(4)	(4)	(4)
Hispanic	2,900	(4)	800	(4)	100

Table 15. - continued

Field and racial/ethnic group	Total Employed (1)	Research	Development	Management of R&D	General management
Environmental scientists	12,900	4,400	800	500	1,400
White	12,400	4,200	700	500	1,400
Black	100	(4)	(4)	(4)	(4)
Asian	200	100	100	(4)	(4)
Native American	100	(4)	(4)	(4)	(4)
Hispanic	200	100	(4)	(4)	(4)
Life scientists	102,800	32,300	5,100	4,000	13,000
White	89,100	27,600	4,600	3,800	10,900
Black	3,300	1,400	(4)	100	600
Asian	5,600	2,400	500	100	500
Native American	1,000	(4)	(4)	(4)	600
Hispanic	4,100	1,400	(4)	(4)	500
Psychologists	115,200	7,600	1,700	4,300	24,400
White	102,500	6,700	1,500	4,000	19,700
Black	6,000	400	(4)	300	1,100
Asian	4,400	200	(4)	(4)	3,300
Native American	500	(4)	(4)	(4)	(4)
Hispanic	3,100	300	(4)	(4)	600
Social scientists	134,000	10,800	1,700	8,100	36,400
White	115,800	10,100	1,500	7,000	30,500
Black	9,400	200	100	700	3,000
Asian	5,000	400	(4)	500	1,400
Native American	400	200	(4)	(4)	200
Hispanic	4,000	(4)	(4)	(4)	1,400
Engineers, total	99,000	8,900	32,200	4,300	8,900
White	84,100	8,100	27,900	3,400	7,500
Black	4,400	(4)	800	100	500
Asian	7,300	500	2,300	700	600
Native American	300	(4)	100	(4)	(4)
Hispanic	3,200	200	1,100	(4)	400

Table 15. - continued

Field and racial/ethnic group	Teaching	Production/ inspection	Reporting, statistical work, and computing
Total, all fields (2)	81,500	53,600	131,700
White	73,600	45,000	114,400
Black	2,800	3,400	7,100
Asian	2,600	3,700	8,200
Native American	200	100	300
Hispanic (3)	3,500	1,500	2,400
Scientists, total	77,500	34,600	122,400
White	70,400	28,700	107,300
Black	2,800	2,300	5,800
Asian	2,100	2,600	7,500
Native American	200	100	100
Hispanic	3,400	800	2,200
Physical scientists	6,800	8,000	1,200
White	6,400	5,700	1,100
Black	100	400	(4)
Asian	100	1,900	(4)
Native American	(4)	(4)	(4)
Hispanic	200	100	(4)
Mathematical scientists	12,800	1,600	5,600
White	11,600	1,100	4,900
Black	700	400	400
Asian	200	(4)	300
Native American	(4)	(4)	(4)
Hispanic	700	(4)	200
Computer specialists	6,800	4,500	90,600
White	6,000	4,000	79,400
Black	100	300	4,500
Asian	200	200	5,600
Native American	(4)	(4)	100
Hispanic	400	(4)	1,300

Table 15. - continued

Field and racial/ethnic group	Teaching	Production/ inspection	Reporting, statistical work, and computing
Environmental scientists	900	1,800	1,100
White	900	1,700	1,100
Black	(4)	(4)	(4)
Asian	(4)	(4)	(4)
Native American	(4)	(4)	(4)
Hispanic	(4)	100	(4)
Life scientists	14,700	9,300	4,500
White	13,500	8,200	3,800
Black	300	200	100
Asian	600	400	(4)
Native American	(4)	100	(4)
Hispanic	400	500	100
Psychologists	13,200	3,400	3,300
White	12,100	3,100	2,900
Black	500	300	200
Asian	100	(4)	200
Native American	200	(4)	(4)
Hispanic	400	100	200
Social scientists	22,300	5,900	16,000
White	19,800	4,800	14,000
Black	1,000	600	500
Asian	800	100	1,400
Native American	(4)	(4)	(4)
Hispanic	1,300	(4)	400
Engineers, total	3,900	19,000	9,400
White	3,200	16,300	7,100
Black	(4)	1,100	1,300
Asian	500	1,100	700
Native American	(4)	(4)	100
Hispanic	100	800	200

(1) Includes consulting, other, and no report.
(2) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(3) Includes members of all racial groups.
(4) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 16. Doctoral scientists and engineers in four-year colleges and universities, by field, racial/ethnic group, and tenure status: 1987

Field and racial/ethnic group	Total, four-year colleges & universities (1)	Tenure-track: Tenured	Tenure-track: Not tenured	Non-tenure track
Total, all fields (2)	209,400	116,900	32,200	18,600
White	187,900	107,500	28,200	16,200
Black	3,700	1,600	900	300
Asian	16,000	6,800	2,800	2,000
Native American	300	200	(4)	(4)
Hispanic (3)	3,500	1,600	700	400
Scientists, total	185,700	103,500	28,100	17,300
White	168,300	95,700	25,300	15,300
Black	3,400	1,600	700	300
Asian	12,400	5,300	1,900	1,700
Native American	300	200	(4)	(4)
Hispanic	3,000	1,300	600	400
Physical scientists	28,700	16,000	2,500	2,300
White	25,700	14,900	2,200	1,900
Black	300	100	(4)	(4)
Asian	2,600	900	200	400
Native American	100	100	(4)	(4)
Hispanic	500	200	(4)	(4)
Mathematical scientists	13,000	9,000	2,000	600
White	11,600	8,300	1,700	400
Black	100	100	(4)	(4)
Asian	1,200	600	300	200
Native American	(4)	(4)	(4)	(4)
Hispanic	200	100	100	(4)
Computer specialists	5,400	2,200	1,500	400
White	4,900	2,000	1,200	400
Black	(4)	(4)	(4)	(4)
Asian	500	200	200	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	100	100	(4)	(4)
Environmental scientists	7,400	3,800	1,200	700
White	6,900	3,700	1,100	600
Black	100	(4)	(4)	(4)
Asian	400	100	(4)	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	100	100	(4)	(4)

Table 16. - continued

Field and racial/ethnic group	Total, four-year colleges & universities (1)	Tenure-track: Tenured	Tenure-track: Not tenured	Non-tenure track
Life scientists	64,700	32,200	10,600	8,100
White	58,200	29,700	9,600	7,100
Black	1,000	400	200	100
Asian	5,000	1,900	700	900
Native American	100	(4)	(4)	(4)
Hispanic	1,000	300	200	100
Psychologists	22,000	12,100	3,100	2,300
White	20,700	11,600	2,800	2,100
Black	600	200	100	100
Asian	400	200	100	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	300	100	100	(4)
Social scientists	44,400	28,100	7,300	3,000
White	40,200	25,600	6,500	2,700
Black	1,300	700	300	100
Asian	2,400	1,400	500	100
Native American	100	100	(4)	(4)
Hispanic	800	400	200	100
Engineers, total	23,600	13,400	4,100	1,300
White	19,600	11,700	2,900	900
Black	300	100	200	(4)
Asian	3,600	1,600	900	300
Native American	(4)	(4)	(4)	(4)
Hispanic	400	300	(4)	(4)

(1) Includes tenure status unknown and no report.
(2) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(3) Includes members of all racial groups.
(4) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 17. Doctoral men scientists and engineers in four-year colleges and universities, by field, racial/ethnic group, and tenure status: 1987

Field and racial/ethnic group	Total, four-year colleges & universities (1)	Tenure-track: Tenured	Tenure-track: Not tenured	Non-tenure track
Total, all fields (2)	174,500	104,400	24,500	12,500
White	156,700	96,000	21,300	10,700
Black	2,600	1,300	500	200
Asian	13,700	6,200	2,500	1,500
Native American	300	200	(4)	(4)
Hispanic (3)	2,800	1,400	500	300
Scientists, Total	151,400	91,000	20,700	11,300
White	137,500	84,300	18,500	9,800
Black	2,400	1,200	300	200
Asian	10,200	4,600	1,600	1,200
Native American	200	200	(4)	(4)
Hispanic	2,400	1,100	500	300
Physical scientists	26,300	15,200	2,200	1,900
White	23,700	14,200	1,900	1,500
Black	200	100	(4)	(4)
Asian	2,200	800	200	300
Native American	100	100	(4)	(4)
Hispanic	400	200	(4)	(4)
Mathematical scientists	11,800	8,300	1,700	500
White	10,600	7,800	1,400	300
Black	100	100	(4)	(4)
Asian	1,000	500	200	100
Native American	(4)	(4)	(4)	(4)
Hispanic	200	100	100	(4)
Computer specialists	4,900	2,100	1,300	400
White	4,400	1,900	1,100	300
Black	(4)	(4)	(4)	(4)
Asian	400	100	100	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	100	100	(4)	(4)
Environmental scientists	6,800	3,700	1,000	600
White	6,400	3,500	1,000	500
Black	100	(4)	(4)	(4)
Asian	300	100	100	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	100	100	(4)	(4)

Table 17. - continued

Field and racial/ethnic group	Total, four-year colleges & universities (1)	Tenure-track: Tenured	Tenure-track: Not tenured	Non-tenure track
Life scientists	50,600	28,000	7,500	5,000
White	45,600	25,900	6,800	4,300
Black	700	300	100	100
Asian	4,000	1,700	500	600
Native American	(4)	(4)	(4)	(4)
Hispanic	700	300	100	100
Psychologists	15,300	9,600	1,700	1,200
White	14,600	6,300	900	500
Black	300	100	(4)	(4)
Asian	200	100	100	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	200	100	(4)	(4)
Social scientists	35,700	24,100	5,200	1,800
White	32,300	21,800	4,700	1,600
Black	1,000	600	100	(4)
Asian	2,000	1,300	400	100
Native American	100	100	(4)	(4)
Hispanic	600	300	100	100
Engineers, total	23,100	13,300	3,800	1,200
White	19,200	11,600	2,700	900
Black	200	100	200	(4)
Asian	3,500	1,600	900	300
Native American	(4)	(4)	(4)	(4)
Hispanic	400	300	(4)	(4)

(1) Includes tenure status unknown and no report.
(2) Detail will not add to total employed because
    a) racial and ethnic categories are not mutually exclusive and
    b) total employed includes other and no report.
(3) Includes members of all racial groups.
(4) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 18. Doctoral women scientists and engineers in four-year colleges and universities, by field, racial/ethnic group, and tenure status: 1987

Field and racial/ethnic group	Total, four-year colleges & universities (1)	Tenure-track: Tenured	Tenure-track: Not tenured	Non-tenure track
Total, all fields (2)	34,900	12,600	7,700	6,100
White	31,200	11,500	6,900	5,500
Black	1,100	300	300	100
Asian	2,300	600	400	500
Native American	100	(4)	(4)	(4)
Hispanic (3)	700	200	200	100
Scientists, total	34,300	12,400	7,500	6,000
White	30,800	11,400	6,700	5,400
Black	1,100	300	300	100
Asian	2,200	600	300	500
Native American	100	(4)	(4)	(4)
Hispanic	700	200	200	100
Physical scientists	2,400	800	400	500
White	2,000	700	300	400
Black	(4)	(4)	(4)	(4)
Asian	300	100	(4)	100
Native American	(4)	(4)	(4)	(4)
Hispanic	100	(4)	(4)	(4)
Mathematical scientists	1,200	600	300	100
White	1,000	500	300	100
Black	(4)	(4)	(4)	(4)
Asian	200	100	(4)	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	(4)	(4)	(4)	(4)
Computer specialists	600	200	200	(4)
White	500	100	200	(4)
Black	(4)	(4)	(4)	(4)
Asian	(4)	(4)	(4)	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	(4)	(4)	(4)	(4)
Environmental scientists	600	200	100	100
White	500	100	100	100
Black	(4)	(4)	(4)	(4)
Asian	(4)	(4)	(4)	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	(4)	(4)	(4)	(4)

Table 18. - continued

Field and racial/ethnic group	Total, four-year colleges & universities (1)	Tenure-track: Tenured	Tenure-track: Not tenured	Non-tenure track
Life scientists	14,200	4,200	3,100	3,100
White	12,600	3,800	2,800	2,800
Black	300	100	100	(4)
Asian	1,100	200	200	200
Native American	(4)	(4)	(4)	(4)
Hispanic	200	100	100	100
Psychologists	6,700	2,500	1,400	1,000
White	6,200	2,300	1,300	1,000
Black	300	100	100	(4)
Asian	200	100	(4)	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	100	(4)	(4)	(4)
Social scientists	8,700	4,000	2,000	1,200
White	7,900	3,800	1,800	1,100
Black	400	100	200	(4)
Asian	300	100	(4)	100
Native American	(4)	(4)	(4)	(4)
Hispanic	200	100	100	(4)
Engineers, total	600	100	200	100
White	500	100	200	100
Black	(4)	(4)	(4)	(4)
Asian	100	(4)	(4)	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	(4)	(4)	(4)	(4)

(1) Includes tenure status unknown and no report.
(2) Detail will not add to total employed because
    a) racial and ethnic categories are not mutually exclusive and
    b) total employed includes other and no report.
(3) Includes members of all racial groups.
(4) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 19. Doctoral scientists and engineers in four-year colleges and universities, by field, racial/ethnic group, and academic rank: 1987

Field and racial/ethnic group	Academic rank			
	Total, four-year colleges & universities (1)	Full professor	Associate Professor	Assistant Professor
Total, all fields (2)	209,400	85,800	50,500	36,500
White	187,900	78,600	45,200	32,100
Black	3,700	1,000	1,200	800
Asian	16,000	5,700	3,500	3,300
Native American	300	100	100	(4)
Hispanic (3)	3,500	1,000	800	800
Scientists, total	185,700	74,500	45,600	32,700
White	168,300	68,500	41,400	29,400
Black	3,400	900	1,100	700
Asian	12,400	4,400	2,600	2,400
Native American	300	100	100	(4)
Hispanic	3,000	800	700	800
Physical scientists	28,700	13,300	4,800	3,000
White	25,700	12,100	4,500	2,700
Black	300	100	(4)	100
Asian	2,600	900	200	300
Native American	100	(4)	(4)	(4)
Hispanic	500	200	(4)	(4)
Mathematical scientists	13,000	6,400	3,200	2,500
White	11,600	5,900	2,900	2,000
Black	100	100	100	(4)
Asian	1,200	400	300	400
Native American	(4)	(4)	(4)	(4)
Hispanic	200	100	(4)	100
Computer specialists	5,400	1,300	1,600	1,300
White	4,900	1,300	1,500	1,100
Black	(4)	(4)	(4)	(4)
Asian	500	100	100	100
Native American	(4)	(4)	(4)	(4)
Hispanic	100	100	(4)	(4)
Environmental scientists	7,400	2,800	1,500	1,300
White	6,900	2,700	1,400	1,200
Black	100	(4)	(4)	(4)
Asian	400	100	100	100
Native American	(4)	(4)	(4)	(4)
Hispanic	100	(4)	(4)	(4)

Table 19. - continued

Field and racial/ethnic group	Academic rank			
	Total, four-year colleges & universities (1)	Full professor	Associate Professor	Assistant Professor
Life scientists	64,700	24,000	15,200	12,400
White	58,200	21,900	13,600	11,200
Black	1,000	300	400	200
Asian	5,100	1,700	1,100	900
Native American	100	(4)	(4)	(4)
Hispanic	1,000	200	200	200
Psychologists	22,000	8,500	5,700	4,000
White	20,700	8,300	5,300	3,700
Black	600	100	200	200
Asian	400	100	100	100
Native American	(4)	(4)	(4)	(4)
Hispanic	300	(4)	100	100
Social scientists	44,400	18,100	13,600	8,300
White	40,200	16,300	12,200	7,500
Black	1,300	400	500	300
Asian	2,400	1,100	700	400
Native American	100	(4)	(4)	(4)
Hispanic	800	200	200	300
Engineers, total	23,600	11,400	4,900	3,700
White	19,600	10,000	3,800	2,700
Black	300	(4)	100	100
Asian	3,600	1,200	900	900
Native American	(4)	(4)	(4)	(4)
Hispanic	400	100	200	(4)

(1) Includes instructor, other, and no report.
(2) Detail will not add to total employed because
  a) racial and ethnic categories are not mutually exclusive and
  b) total employed includes other and no report.
(3) Includes members of all racial groups.
(4) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 20. Doctoral men scientists and engineers in four-year colleges and universities, by field, racial/ethnic group, and academic rank: 1987

Field and racial/ethnic group	Academic rank			
	Total, four-year colleges & universities (1)	Full professor	Associate Professor	Assistant Professor
Total, all fields (2)	174,500	79,600	41,700	26,400
White	156,700	72,900	37,300	23,000
Black	2,600	800	900	400
Asian	13,700	5,300	3,000	2,700
Native American	300	100	100	(4)
Hispanic (3)	2,800	900	700	600
Scientists, total	151,400	68,300	37,000	22,900
White	137,500	62,900	33,600	20,500
Black	2,400	800	800	300
Asian	10,200	4,100	2,100	1,900
Native American	200	100	100	(4)
Hispanic	2,400	800	500	600
Physical scientists	26,300	12,800	4,400	2,500
White	23,700	11,700	4,200	2,200
Black	200	100	(4)	(4)
Asian	2,200	900	200	300
Native American	100	(4)	(4)	(4)
Hispanic	400	200	(4)	(4)
Mathematical scientists	11,800	6,100	2,800	2,000
White	10,600	5,700	2,500	1,700
Black	100	100	(4)	(4)
Asian	1,000	400	200	300
Native American	(4)	(4)	(4)	(4)
Hispanic	200	100	(4)	100
Computer specialists	4,900	1,300	1,500	1,100
White	4,400	1,200	1,300	900
Black	(4)	(4)	(4)	(4)
Asian	400	100	100	100
Native American	(4)	(4)	(4)	(4)
Hispanic	100	100	(4)	(4)
Environmental scientists	6,800	2,700	1,400	1,100
White	6,400	2,600	1,300	1,100
Black	100	(4)	(4)	(4)
Asian	300	100	100	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	100	(4)	(4)	(4)

Table 20. - continued

Field and racial/ethnic group	Academic rank			
	Total, four-year colleges & universities (1)	Full professor	Associate Professor	Assistant Professor
Life scientists	50,600	21,800	11,800	8,500
White	45,600	20,000	10,600	7,700
Black	700	200	200	100
Asian	4,000	1,500	900	600
Native American	(4)	(4)	(4)	(4)
Hispanic	700	200	200	200
Psychologists	15,300	7,300	4,100	2,200
White	14,600	7,100	3,800	2,000
Black	300	100	100	100
Asian	200	100	(4)	100
Native American	(4)	(4)	(4)	(4)
Hispanic	200	(4)	100	100
Social scientists	35,700	16,300	11,000	3,500
White	32,300	14,700	9,900	4,900
Black	1,000	400	400	100
Asian	2,000	1,000	600	400
Native American	100	(4)	(4)	(4)
Hispanic	600	200	200	200
Engineers, total	23,100	11,300	4,700	3,500
White	19,200	10,000	3,700	2,500
Black	200	(4)	100	100
Asian	3,500	1,200	900	900
Native American	(4)	(4)	(4)	(4)
Hispanic	400	100	200	(4)

(1) Includes instructor, other, and no report.
(2) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(3) Includes members of all racial groups.
(4) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 21. Doctoral women scientists and engineers in four-year colleges and universities, by field, racial/ethnic group, and academic rank: 1987

Field and racial/ethnic group	Academic rank			
	Total, four-year colleges & universities (1)	Full professor	Associate Professor	Assistant Professor
Total, all fields (2)	34,900	6,200	8,800	10,100
White	31,200	5,600	8,000	9,100
Black	1,100	100	300	400
Asian	2,300	400	400	500
Native American	100	(4)	(4)	(4)
Hispanic (3)	700	100	100	200
Scientists, Total	34,300	6,100	8,600	9,900
White	30,800	5,600	7,800	8,900
Black	1,100	100	300	400
Asian	2,200	400	400	500
Native American	100	(4)	(4)	(4)
Hispanic	700	100	100	200
Physical scientists	2,400	500	400	500
White	2,000	500	300	500
Black	(4)	(4)	(4)	(4)
Asian	300	(4)	100	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	100	(4)	(4)	(4)
Mathematical scientists	1,200	300	400	400
White	1,000	200	300	300
Black	(4)	(4)	(4)	(4)
Asian	200	(4)	100	100
Native American	(4)	(4)	(4)	(4)
Hispanic	(4)	(4)	(4)	(4)
Computer specialists	600	100	100	200
White	500	100	100	200
Black	(4)	(4)	(4)	(4)
Asian	(4)	(4)	(4)	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	(4)	(4)	(4)	(4)
Environmental scientists	600	100	100	200
White	500	(4)	100	200
Black	(4)	(4)	(4)	(4)
Asian	(4)	(4)	(4)	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	(4)	(4)	(4)	(4)

Table 21. - continued

Field and racial/ethnic group	Academic rank			
	Total, four-year colleges & universities (1)	Full professor	Associate Professor	Assistant Professor
Life scientists	14,200	2,200	3,400	3,900
White	12,600	1,900	3,100	3,500
Black	300	100	100	100
Asian	1,100	200	200	300
Native American	(4)	(4)	(4)	(4)
Hispanic	200	(4)	(4)	100
Psychologists	6,700	1,200	1,600	1,900
White	6,200	1,200	1,500	1,700
Black	300	(4)	100	100
Asian	200	(4)	(4)	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	100	(4)	(4)	(4)
Social scientists	8,700	1,800	2,500	2,800
White	7,900	1,700	2,300	2,500
Black	400	(4)	100	200
Asian	300	100	100	100
Native American	(4)	(4)	(4)	(4)
Hispanic	200	(4)	100	100
Engineers, Total	600	100	100	200
White	500	100	100	200
Black	(4)	(4)	(4)	(4)
Asian	100	(4)	(4)	(4)
Native American	(4)	(4)	(4)	(4)
Hispanic	(4)	(4)	(4)	(4)

(1) Includes instructor, other, and no report.
(2) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(3) Includes members of all racial groups.
(4) Too few cases to estimate.

SOURCE: National Science Foundation, SRS.

Table 22. Selected employment characteristics of scientists and engineers, by field, gender, and racial/ethnic group: 1986

Field and racial/ethnic group	Labor force participation rate			Unemployment rate			S/E underemployment rate		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Total, all fields (1)	94.5	94.6	93.9	1.5	1.3	2.7	2.6	1.9	6.3
White	94.3	94.4	93.8	1.5	1.3	2.6	2.5	1.9	6.1
Black	97.2	97.6	96.4	3.8	2.8	6.0	5.5	3.7	9.7
Asian	96.3	97.0	93.1	1.8	1.9	1.6	2.2	1.8	4.1
Native American	96.0	95.9	96.8	1.2	1.3	(3)	2.4	1.1	13.1
Hispanic (2)	95.2	96.1	92.2	2.1	2.2	1.7	4.8	2.5	13.4
Scientists, total	95.3	95.9	94.0	1.9	1.6	2.7	4.3	3.3	7.0
White	95.2	95.8	93.8	1.8	1.5	2.6	4.2	3.3	6.7
Black	97.0	97.2	96.7	3.7	1.6	6.5	7.5	5.2	10.8
Asian	96.1	97.5	93.2	2.3	2.8	1.1	3.5	3.0	4.6
Native American	96.6	96.7	96.4	2.1	2.7	(3)	5.0	2.1	14.7
Hispanic	94.9	96.5	91.9	3.0	3.8	1.4	8.2	4.0	15.9
Physical scientists	93.6	94.1	90.8	1.4	1.2	3.1	1.9	1.6	3.5
White	93.5	94.0	90.2	1.4	1.1	3.1	1.7	1.5	3.0
Black	98.1	98.4	97.6	2.6	2.0	4.2	4.6	3.1	8.5
Asian	93.0	93.5	91.9	1.2	1.3	.9	2.5	2.2	3.3
Native American	80.7	80.7	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	94.1	97.3	83.1	3.2	1.3	10.7	1.8	1.7	2.6
Mathematical scientists	94.6	95.4	92.6	1.3	.8	2.7	3.3	2.0	7.1
White	94.2	95.0	92.1	1.3	.7	2.7	3.1	1.8	6.8
Black	98.4	98.4	98.5	1.2	(3)	3.4	4.2	5.5	1.8
Asian	97.9	98.4	94.8	2.3	2.6	(3)	3.9	3.3	7.5
Native American	100.0	100.0	100.0	(3)	(3)	(3)	44.0	(3)	86.2
Hispanic	97.6	97.7	97.4	.9	1.4	(3)	3.6	1.5	6.9
Computer specialists	98.5	99.4	96.5	.8	.6	1.6	2.5	2.5	2.5
White	98.6	99.4	96.6	.8	.5	1.6	2.4	2.4	2.2
Black	99.2	100.0	98.0	1.2	.3	2.7	4.2	2.7	6.6
Asian	97.6	99.3	92.7	.6	.5	1.0	2.7	2.5	3.4
Native American	100.0	100.0	100.0	1.9	2.2	(3)	(3)	(3)	(3)
Hispanic	96.4	100.0	89.3	.9	1.3	(3)	5.5	6.6	3.1

Table 22. - continued

Field and racial/ethnic group	Labor force participation rate			Unemployment rate			S/E underemployment rate		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Environmental scientists	94.5	94.8	92.1	4.4	3.9	8.2	5.6	4.8	11.6
White	94.4	94.7	91.9	4.5	4.0	8.4	5.5	4.6	11.7
Black	97.5	97.1	100.0	.6	.2	2.8	4.4	5.1	(3)
Asian	97.3	97.1	100.0	2.6	2.9	(3)	8.8	9.7	(3)
Native American	93.8	93.0	100.0	(3)	(3)	(3)	15.5	10.2	50.0
Hispanic	95.0	94.5	100.0	4.8	5.3	(3)	9.0	8.9	9.6
Life scientists	93.0	94.1	90.0	2.1	1.7	3.4	4.7	3.1	9.6
White	92.8	93.9	89.5	2.1	1.6	3.4	4.4	3.1	8.5
Black	98.5	98.8	97.9	3.8	1.4	7.4	7.3	3.4	13.7
Asian	94.0	96.1	90.7	2.6	2.1	3.3	7.5	3.2	14.7
Native American	100.0	100.0	100.0	(3)	(3)	(3)	.7	(3)	2.0
Hispanic	92.2	94.2	89.5	.8	1.3	(3)	16.2	5.7	31.5
Psychologists	95.1	94.9	95.3	2.5	2.2	3.0	5.7	4.7	6.8
White	95.0	94.7	95.4	2.3	1.8	3.0	5.8	4.8	7.0
Black	94.5	97.0	93.3	3.6	1.5	4.6	4.9	(3)	7.5
Asian	99.0	100.0	98.8	4.3	23.0	(3)	(3)	(3)	(3)
Native American	100.0	100.0	100.0	8.5	11.2	(3)	11.5	(3)	44.6
Hispanic	96.1	96.3	95.9	4.3	4.8	3.8	7.1	5.3	8.7
Social scientists	95.4	95.8	94.6	2.4	2.3	2.7	7.2	5.4	11.1
White	95.3	95.8	94.3	2.0	2.0	2.1	6.9	5.2	10.9
Black	95.0	93.7	96.8	6.8	3.4	11.2	13.1	9.8	17.9
Asian	96.1	97.8	92.9	6.4	9.6	(3)	3.0	4.3	.5
Native American	95.0	100.0	81.1	(3)	(3)	(3)	7.5	9.7	(3)
Hispanic	95.0	95.6	93.8	5.8	8.7	(3)	7.7	.6	20.9
Engineers, total	93.8	93.8	93.6	1.2	1.2	2.5	1.0	1.0	2.3
White	93.5	93.5	93.5	1.2	1.1	2.5	1.0	.9	2.4
Black	97.7	98.0	94.8	4.0	4.2	2.0	2.0	1.9	2.3
Asian	96.5	96.7	93.0	1.5	1.4	3.7	1.2	1.1	1.9
Native American	95.6	95.5	100.0	.4	.4	(3)	.4	.5	(3)
Hispanic	95.6	95.8	93.4	1.2	1.0	3.2	1.4	1.5	.8

(1) Detail will not average to the total because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

NOTE: See Technical Notes for definition of rates.
SOURCE: National Science Foundation, SRS.

Table 23. Selected characteristics of doctoral scientists and engineers, by field, gender, racial/ethnic group: 1987

Field and racial/ethnic group	Labor force participation rate			Unemployment rate			Underemployment rate		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Total, all fields (1)	93.8	94.1	92.8	1.1	0.9	2.0	1.3	1.0	3.3
White	93.4	93.6	92.5	1.0	.8	1.9	1.4	1.0	3.2
Black	97.0	97.7	95.3	2.0	2.7	.5	2.4	2.0	2.9
Asian	98.2	98.7	95.1	1.3	.9	3.8	.8	.5	2.3
Native American	96.1	97.1	92.4	3.0	3.2	2.5	1.1	2.1	3.4
Hispanic (2)	97.4	97.5	96.7	.9	.6	2.2	1.2	.4	3.0
Scientists, total	93.5	93.7	92.7	1.2	1.0	2.0	1.5	1.1	3.4
White	93.1	93.3	92.4	1.1	.9	1.9	1.5	1.1	3.3
Black	96.7	97.4	95.3	2.2	3.1	.5	2.6	2.3	2.9
Asian	97.8	98.4	95.0	1.6	1.1	3.9	.8	.6	2.4
Native American	96.0	96.9	92.7	3.2	3.4	2.6	1.2	2.3	3.6
Hispanic	97.7	98.0	96.6	.9	.5	2.3	1.3	.5	2.9
Physical scientists	91.9	92.0	90.1	1.4	1.2	3.0	.7	.7	1.5
White	91.1	91.2	89.0	1.1	1.0	1.8	.8	.7	1.2
Black	99.3	99.7	96.2	6.5	7.3	(3)	2.7	2.8	2.7
Asian	98.7	99.4	94.4	2.5	1.4	9.0	.2	.6	1.2
Native American	100.0	100.0	100.0	4.0	4.1	(3)	(3)	(3)	(3)
Hispanic	95.4	95.7	93.4	.4	.2	1.4	.8	.9	(3)
Mathematical scientists	94.8	95.2	91.6	1.0	.9	1.6	.4	.3	1.8
White	94.5	94.9	90.7	1.1	1.0	1.5	.5	.2	2.1
Black	100.0	100.0	100.0	1.8	(3)	8.6	(3)	(3)	(3)
Asian	97.1	97.2	96.2	.2	(3)	1.5	(3)	(3)	(3)
Native American	100.0	100.0	100.0	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	99.3	100.0	94.4	1.1	(3)	8.8	(3)	(3)	(3)
Computer specialists	99.8	100.0	98.6	0.1	0.1	0.2	0.8	0.7	1.1
White	99.8	100.0	98.4	.1	.1	.2	.8	.8	1.1
Black	100.0	100.0	100.0	(3)	(3)	(3)	4.5	4.7	(3)
Asian	100.0	100.0	100.0	(3)	(3)	(3)	(3)	(3)	(3)
Native American	100.0	100.0	100.0	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	100.0	100.0	100.0	(3)	(3)	(3)	1.2	1.3	(3)
Environmental scientists	94.7	94.9	92.7	.9	.8	3.0	.9	.6	4.8
White	94.7	94.9	92.3	.8	.7	2.8	1.0	.7	5.2
Black	99.1	100.0	84.6	(3)	(3)	(3)	(3)	(3)	(3)
Asian	96.6	96.2	100.0	1.7	1.5	3.0	(3)	(3)	(3)
Native American	100.0	100.0	100.0	15.0	(3)	75.0	(3)	(3)	(3)
Hispanic	100.0	100.0	100.0	4.7	4.0	12.0	.7	.8	(3)

Table 23. - continued

Field and racial/ethnic group	Labor force participation rate			Unemployment rate			Underemployment rate		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Life scientists	92.7	93.0	91.3	1.4	1.1	2.3	1.3	.9	2.6
White	92.3	92.7	91.0	1.4	1.1	2.4	1.3	1.0	2.9
Black	94.9	95.9	92.9	2.7	4.1	(3)	2.3	3.4	2.7
Asian	97.0	97.9	94.0	1.1	.7	2.4	.8	.6	1.8
Native American	89.5	91.4	86.0	1.6	2.4	(3)	.8	4.8	2.3
Hispanic	97.6	97.5	97.9	.8	.3	2.7	1.5	(3)	4.6
Psychologists	95.6	95.8	95.1	.7	.6	1.0	1.6	1.1	2.5
White	95.4	95.7	95.0	.6	.5	1.0	1.5	.9	2.4
Black	97.6	98.3	97.0	.2	.3	.1	2.7	2.2	3.1
Asian	98.3	100.0	96.2	1.4	.6	2.3	2.4	2.5	1.1
Native American	98.3	100.0	94.6	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	96.1	96.2	96.0	(3)	(3)	(3)	2.6	.6	2.3
Social scientists	92.4	92.5	92.1	1.4	1.0	2.9	3.2	2.2	6.9
White	92.1	92.1	91.8	1.3	.8	2.9	3.2	2.4	6.0
Black	95.8	96.0	95.2	2.3	2.9	1.1	3.0	1.6	3.1
Asian	97.2	97.5	95.4	2.5	2.3	3.5	2.4	.6	9.8
Native American	96.7	96.1	100.0	5.4	6.6	(3)	3.6	4.4	11.5
Hispanic	99.4	100.0	97.1	1.2	.5	4.0	1.0	.4	3.8
Engineers, total	95.9	95.9	96.7	.6	.6	1.1	.5	.5	1.1
White	95.1	95.0	96.7	.6	.6	.7	.4	.4	1.1
Black	99.7	100.0	96.4	(3)	(3)	(3)	.5	.2	3.7
Asian	99.1	99.2	96.9	.7	.6	3.2	.9	.5	.7
Native American	97.3	100.0	87.5	(3)	(3)	(3)	(3)	(3)	(3)
Hispanic	95.6	95.5	100.0	1.1	1.1	(3)	.2	(3)	6.1

(1) Detail will not average to the total because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

NOTE: See Technical Notes for definition of rates.
SOURCE: National Science Foundation, SRS.

Table 24. Selected characteristics of recent science and engineering graduates, by degree level, field, gender, and racial/ethnic group: 1988

(Exclusive of Full-time Graduate Students)

Field and rate	Bachelor's Recipients (3)							
	Total (1)	Men	Women	White	Black	Asian	Native American	Hispanic (2)
Total, all fields								
Labor Force Participation Rate	97.7	88.3	96.7	97.5	98.3	97.8	91.4	97.0
Unemployment Rate	2.4	2.4	2.6	2.3	3.4	3.5	7.8	4.4
Sciences, total								
Labor Force Participation Rate	97.2	97.7	96.5	96.9	98.5	98.1	90.0	95.9
Unemployment Rate	2.6	2.6	2.6	2.7	1.6	2.5	10.3	5.4
Physical sciences								
Labor Force Participation Rate	94.7	96.6	91.0	94.2	97.8	100.0	100.0	97.3
Unemployment Rate	3.6	2.4	6.1	4.0	.0	7.4	.0	5.8
Math/Statistics								
Labor Force Participation Rate	97.6	98.5	96.6	97.8	100.0	100.0	(4)	100.0
Unemployment Rate	3.9	4.8	2.9	3.4	7.3	.0	(4)	12.0
Computer science								
Labor Force Participation Rate	98.7	99.7	96.9	98.4	100.0	100.0	89.2	97.0
Unemployment Rate	2.2	2.4	1.8	1.9	4.6	5.1	.0	3.1
Environmental science								
Labor Force Participation Rate	96.5	98.3	90.3	96.8	100.0	100.0	(4)	93.8
Unemployment Rate	3.5	3.8	2.6	3.2	5.7	40.0	(4)	.0
Life sciences								
Labor Force Participation Rate	94.9	97.0	92.9	94.8	100.0	92.0	100.0	88.1
Unemployment Rate	2.2	1.9	2.5	2.3	.0	.0	.0	14.2
Psychology								
Labor Force Participation Rate	97.0	96.0	97.6	97.1	100.0	100.0	75.3	100.0
Unemployment Rate	1.8	2.0	1.7	2.2	.6	.0	.0	7.5
Social sciences								
Labor Force Participation Rate	97.7	97.2	98.4	97.2	96.0	100.0	100.0	95.4
Unemployment Rate	3.1	2.9	3.4	3.3	.0	.0	25.1	.0
Engineering, total								
Labor Force Participation Rate	99.1	99.1	98.6	99.1	97.8	97.3	96.1	100.0
Unemployment Rate	2.0	1.9	2.4	1.3	8.5	5.0	.0	2.0

See footnotes at end of table.

Table 24. - continued

Field and rate	Master's Recipients (3)							
	Total (1)	Men	Women	White	Black	Asian	Native American	Hispanic (2)
Total, all fields								
Labor Force Participation Rate	97.3	98.6	94.2	97.4	97.4	93.1	99.3	99.6
Unemployment Rate	1.7	1.5	2.4	1.5	3.7	3.9	.0	.0
Sciences, total								
Labor Force Participation Rate	96.8	98.4	93.9	96.8	96.8	91.7	100.0	100.0
Unemployment Rate	1.8	1.3	2.7	1.7	2.2	3.4	.0	.0
Physical sciences								
Labor Force Participation Rate	95.7	98.0	(1)	95.9	100.0	93.3	(4)	100.0
Unemployment Rate	2.9	2.3	(1)	1.9	.0	10.9	(4)	.0
Math/Statistics								
Labor Force Participation Rate	95.9	96.2	95.1	96.3	78.0	94.0	(4)	100.0
Unemployment Rate	1.1	1.3	.8	.7	.0	.0	(4)	.0
Computer science								
Labor Force Participation Rate	97.4	99.0	93.7	98.2	100.0	88.2	(4)	100.0
Unemployment Rate	1.1	.7	2.1	.6	.0	4.7	(4)	.0
Environmental science								
Labor Force Participation Rate	95.6	99.1	(1)	94.3	100.0	100.0	100.0	100.0
Unemployment Rate	1.9	1.3	(1)	1.9	14.8	.0	.0	.0
Life sciences								
Labor Force Participation Rate	98.7	99.9	97.2	98.3	100.0	100.0	100.0	100.0
Unemployment Rate	1.3	.7	2.1	1.6	.0	.0	.0	.0
Psychology								
Labor Force Participation Rate	98.6	100.0	97.6	98.4	100.0	100.0	100.0	(4)
Unemployment Rate	2.5	(1)	4.3	2.9	.0	.0	.0	(4)
Social sciences								
Labor Force Participation Rate	94.3	97.1	90.2	93.6	100.0	100.0	100.0	100.0
Unemployment Rate	3.2	3.0	3.5	3.7	8.6	.0	.0	.0
Engineering, total								
Labor Force Participation Rate	98.6	99.0	96.2	99.0	99.8	95.1	98.8	98.6
Unemployment Rate	1.7	1.8	1.0	1.0	9.3	4.6	.0	.0

(1) Detail will not average to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Graduates who received their degrees in either academic year 1986 or 1987.
(4) Too few cases to estimate.

NOTE: See Technical Notes for definition of rates.

SOURCE: National Science Foundation.

Table 25. Average annual salaries of scientists and engineers, by field, gender, and racial/ethnic group: 1986

Field and gender	Total Employed (1)	White	Black	Asian	Native American	Hispanic (2)
Total, all fields	$38,400	$38,700	$31,500	$39,100	$41,000	$34,600
Men	39,800	40,000	33,500	40,700	42,600	36,600
Women	29,900	30,200	26,200	30,100	29,800	25,200
Scientists, total	35,700	35,900	29,000	37,000	40,500	30,600
Men	38,000	38,100	31,400	40,500	44,100	33,900
Women	29,000	29,400	25,400	28,800	29,100	22,900
Physical scientists	40,700	40,900	35,600	39,300	63,400	41,300
Men	42,000	42,000	39,300	42,200	63,400	43,100
Women	31,300	31,800	24,300	31,400	(3)	33,900
Mathematical scientists	39,800	40,000	37,000	38,500	22,500	38,700
Men	42,500	42,800	38,400	39,300	19,900	42,100
Women	31,000	31,000	32,900	30,600	25,000	31,000
Computer specialists	37,300	37,500	32,200	37,400	39,300	31,500
Men	38,900	39,000	34,200	39,600	42,400	33,800
Women	33,200	33,700	29,300	30,800	20,500	25,800
Environmental scientists	37,500	37,600	31,800	40,600	27,000	40,500
Men	38,400	38,500	29,600	41,100	26,700	42,400
Women	30,100	30,100	36,100	35,100	28,000	21,200
Life scientists	33,100	33,200	29,300	35,700	40,600	29,700
Men	35,400	35,400	33,300	40,500	46,500	35,200
Women	25,200	25,100	21,600	28,400	32,500	18,700
Psychologists	33,400	33,900	26,800	22,500	41,200	25,400
Men	36,500	36,600	27,400	39,600	41,900	26,400
Women	29,000	29,700	26,600	19,300	37,400	24,000
Social scientists	31,800	32,200	22,800	38,700	34,300	25,600
Men	34,700	35,100	23,800	41,900	39,100	28,500
Women	25,000	25,200	21,400	31,700	21,500	18,700
Engineers, total	40,800	41,000	35,700	40,500	41,300	38,000
Men	41,100	41,200	35,900	40,800	41,500	38,300
Women	34,300	34,300	32,900	35,000	34,700	33,900

(1) Detail will not average to the total because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

NOTE: Salaries computed for individuals employed full-time.

SOURCE: National Science Foundation, SRS.

Table 26. Average annual salaries of doctoral scientists and engineers, by field, gender, and racial/ethnic group: 1987

Field and gender	Total (1)	White	Black	Asian	Native American	Hispanic (2)
Total, all fields	$49,600	$49,900	$42,800	$45,400	$50,000	$47,200
Men	50,700	50,800	44,800	50,700	46,700	48,600
Women	40,200	40,200	38,800	41,800	32,700	37,300
Scientists, total	47,800	48,000	42,700	47,100	44,900	45,400
Men	49,200	49,600	44,800	48,300	46,500	48,100
Women	40,000	40,000	38,700	40,900	32,000	37,200
Physical scientists	51,400	52,000	43,200	49,100	(3)	51,500
Men	52,400	52,700	43,200	50,400	(3)	53,800
Women	41,900	41,900	42,300	42,300	(3)	37,200
Mathematical scientists	46,600	47,300	46,000	41,000	(3)	44,800
Men	47,500	48,100	46,800	40,800	(3)	45,500
Women	39,600	39,300	(3)	41,500	(3)	(3)
Computer specialists	54,400	54,100	(3)	54,400	(3)	55,800
Men	55,400	55,300	(3)	55,800	(3)	57,200
Women	43,400	43,000	(3)	46,200	(3)	(3)
Environmental scientists	50,300	50,300	48,900	51,000	(3)	44,400
Men	50,700	50,600	48,800	55,200	(3)	44,600
Women	41,800	41,700	(3)	41,300	(3)	(3)
Life scientists	45,700	45,900	42,500	44,800	45,500	42,100
Men	48,000	48,200	44,100	45,800	(3)	44,100
Women	39,600	39,500	38,600	40,800	(3)	36,000
Psychologists	44,300	44,600	40,100	40,400	(3)	43,700
Men	46,200	46,400	40,700	40,800	(3)	50,200
Women	39,500	39,600	38,800	38,900	(3)	36,900
Social scientists	45,300	45,600	40,900	45,500	(3)	42,500
Men	47,000	47,400	44,100	46,300	(3)	44,400
Women	39,600	39,800	36,800	39,000	(3)	38,800
Engineers, total	58,100	59,800	44,700	54,300	(3)	50,300
Men	58,500	60,000	44,200	54,700	(3)	50,500
Women	48,200	48,000	(3)	48,800	(3)	(3)

(1) Detail will not average to the total because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Too few cases to estimate.

NOTE: Salaries computed for individuals employed full-time.

SOURCE: National Science Foundation, SRS.

Table 27. Average annual salaries of recent science and engineering graduates, by degree level, field, gender, and racial/ethnic group: 1988

(Exclusive of Full-time Graduate Students)

Field of degree	Bachelor's Recipients (3)							
	Total (1)	Men	Women	White	Black	Asian	Native American	Hispanic (2)
Total, all fields	$25,100	$27,000	$22,000	$25,100	$23,000	$27,500	$18,000	$25,000
Sciences, total	22,900	24,400	20,900	23,000	24,000	(1)	22,300	21,600
Physical sciences	24,000	24,000	23,000	24,000	(1)	(1)	(1)	(1)
Math/Statistics	24,400	25,000	22,900	24,600	(1)	(1)	(1)	(1)
Computer science	28,000	28,100	27,500	28,300	24,000	28,000	(1)	27,000
Environmental science	22,000	22,000	22,000	22,800	(1)	(1)	(1)	(1)
Life sciences	19,500	20,000	19,000	19,500	(1)	(1)	(1)	(1)
Psychology	19,100	23,000	18,000	18,800	(1)	(1)	(1)	(1)
Social sciences	21,900	23,200	20,000	21,900	21,900	(1)	(1)	(1)
Engineering, total	30,000	30,000	30,000	30,000	29,100	30,000	(1)	29,200

(Exclusive of Full-time Graduate Students)

Field of degree	Master's Recipients (3)							
	Total (1)	Men	Women	White	Black	Asian	Native American	Hispanic (2)
Total, all fields	$34,900	$35,900	$31,000	$34,900	$33,600	$35,800	(1)	$34,000
Sciences, total	32,100	33,900	28,000	32,000	30,000	35,900	(1)	34,000
Physical sciences	30,100	32,000	29,000	31,800	(1)	31,000	(1)	(1)
Math/Statistics	34,200	37,000	31,200	34,200	(1)	(1)	(1)	(1)
Computer science	40,000	40,200	37,200	40,100	(1)	36,000	(1)	(1)
Environmental science	31,000	32,100	26,100	30,000	(1)	(1)	(1)	(1)
Life sciences	25,000	24,100	25,000	25,000	(1)	(1)	(1)	(1)
Psychology	22,000	22,000	22,000	21,700	(1)	(1)	(1)	(1)
Social sciences	26,100	27,700	24,000	26,100	(1)	(1)	(1)	(1)
Engineering, total	37,900	38,000	37,900	38,000	35,300	(1)	32,100	33,300

(1) Detail will not add to total employed because
a) racial and ethnic categories are not mutually exclusive and
b) total employed includes other and no report.
(2) Includes members of all racial groups.
(3) Graduates who received their degrees in either academic year 1986 or 1987.
(4) Too few cases to estimate.

NOTE: Salaries computed for full-time employed civilians.
SOURCE: National Science Foundation.

Table 28. Mean performance on the mathematics assessment, by age level, gender, and racial/ethnic group: 1978, 1982, and 1986

A. Overall Mean Scores

Age level and year	Total	Male	Female	White	Black	Hispanic
A. Age 9						
1978	218.6 *	217.4 *	219.9	224.1	192.4 *	202.9
1982	219.0	217.1 *	220.8	224.0	194.9 *	204.0
1986	221.7	221.7	221.7	226.9	201.6	205.4
B. Age 13						
1978	264.1 *	263.6 *	264.7	271.6	229.6 *	238.0
1982	268.6	269.2	268.0	274.4	240.4 *	252.4
1986	269.0	270.0	268.0	273.6	249.2	254.3
C. Age 17						
1978	300.4	303.8	297.1	305.9	268.4 *	276.3
1982	298.5 *	301.5	295.6 *	303.7 *	271.8 *	276.7
1986	302.0	304.7	299.4	307.5	278.6	283.1

*Difference from 1986 score is statistically significant at the 0.05 level.

B. Percentages of students who scored at or above proficiency levels on 1986 assessment

Age and proficiency levels	Percent					
	Total	Male	Female	White	Black	Hispanic
A. Age 9						
Level 150	97.8	97.7	98.0	98.9	93.0	96.4
Level 200	73.9	74.0	73.9	79.2	53.3	58.7
Level 250	20.8	20.6	20.9	24.5	5.4	8.0
Level 300	0.6	0.6	0.5	0.7	0.0	0.0
Level 350	---	---	---	---	---	---
B. Age 13						
Level 150	---	---	---	---	---	---
Level 200	98.5	98.3	98.7	99.2	95.5	96.1
Level 250	73.1	74.0	72.3	78.7	49.4	55.2
Level 300	15.9	17.6	14.2	18.6	4.0	5.4
Level 350	0.4	0.6	0.2	0.5	0.1	0.3
C. Age 17						
Level 150	---	---	---	---	---	---
Level 200	99.9	99.9	99.9	99.9	100.0	98.9
Level 250	96.0	96.5	95.5	98.3	86.0	90.8
Level 300	51.1	54.2	48.1	58.0	21.7	26.8
Level 350	6.4	8.2	4.5	7.6	0.3	1.2

NOTE: Proficiency levels are defined as follows: (a) Level 150 -- Simple Arithmetic Facts; (b) Level 200 -- Beginning Skills and Understanding; (c) Level 250 -- Basic Operations and Beginning Problem-Solving; (d) Level 300 -- Moderately Complex Procedures and Reasoning; and (e) Level 350 -- Multi-step Problem Solving and Algebra.

SOURCE: Educational Testing Service, THE MATHEMATICS REPORT CARD: ARE WE MEASURING UP? TRENDS AND ACHIEVEMENT BASED ON THE 1986 NATIONAL ASSESSMENT, Report No. 17-M-01, (Princeton, N.J.: Educational Testing Service), June 1988.

Table 29. Mean performance on the science assessment, by age level, gender, and racial/ethnic group: 1977, 1982, and 1986

A. Overall Mean Scores

Age level and year	Total	Male	Female	White	Black	Hispanic
A. Age 9						
1977	219.9 *	222.1 *	217.7	229.6	174.9 *	191.9
1982	220.9	221.0 *	220.7	229.1	187.1 *	189.0
1986	224.3	227.3 *	221.3	231.9	196.2 *	199.4
B. Age 13						
1977	247.4	251.1 *	243.8	256.1	213.4	208.1 *
1982	250.2	255.7	245.0	257.3	225.5	217.2
1986	251.4	256.1	246.9	259.2	226.1	221.6
C. Age 17						
1977	289.6	297.1	282.3	297.7	240.3 *	262.3
1982	283.3	291.9	275.2	293.2 *	234.8 *	248.7 *
1986	288.5	294.9	282.3	297.5	252.8	259.3

*Difference from 1986 score is statistically significant at the 0.05 level.

B. Percentages of students who scored at or above proficiency levels on 1986 assessment

Age and proficiency levels	Percent Total	Male	Female	White	Black	Hispanic
A. Age 9						
Level 150	96.3	96.3	96.3	95.5	87.5	89.6
Level 200	71.4	72.7	70.1	78.4	45.1	49.1
Level 250	27.6	29.4	25.8	32.6	10.7	8.8
Level 300	3.4	4.0	2.7	4.3	0.4	0.2
Level 350	---	---	---	---	---	---
B. Age 13						
Level 150	---	---	---	---	---	---
Level 200	91.8	92.9	90.7	96.4	74.3	76.1
Level 250	53.4	58.4	48.4	61.9	20.2	27.6
Level 300	9.4	12.5	6.4	11.8	0.9	1.6
Level 350	0.2	0.4	0.1	0.3	0.0	0.0
C. Age 17						
Level 150	---	---	---	---	---	---
Level 200	96.7	96.9	96.6	98.6	89.8	92.9
Level 250	80.8	83.1	78.5	87.6	52.9	61.6
Level 300	41.4	49.3	33.8	48.8	12.3	15.5
Level 350	7.5	10.3	4.7	9.0	1.0	0.5

NOTE: Proficiency levels are defined as follows: (a) Level 150 -- Knowledge of Everyday Science Facts; (b) Level 200 -- Understanding of Simple Scientific Principles; (c) Level 250 -- Application of Basic Scientific Information; (d) Level 300 -- Analysis of Scientific Procedures and Data; and (e) Level 350 -- Integration of Specialized Scientific Information.

SOURCE: Educational Testing Service, THE SCIENCE REPORT CARD: ELEMENTS OF RISK AND RECOVERY, TRENDS AND ACHIEVEMENT BASED ON THE 1986 NATIONAL ASSESSMENT, Report No. 17-S-01, (Princeton, N.J.: Educational Testing Service), September 1988.

Table 30. Percentage of college-bound seniors who took natural science, social science, or mathematics coursework in high school, by gender and racial/ethnic group: 1988

Coursework	Percent									
	Total	Male	Female	White	Black	Asian	Native American	Mexican American	Puerto Rican	Latin American
A. Natural science										
Biology	97	96	97	97	96	95	97	96	96	96
Chemistry	78	80	77	80	70	86	70	71	73	76
Physics	42	51	35	43	31	63	30	32	41	42
Honors course	20	21	19	21	12	29	11	18	12	19
B. Social science										
Anthropology	3	3	3	3	2	3	3	2	3	3
Economics	46	46	46	45	49	50	46	69	35	53
Psychology	29	22	35	31	20	22	28	21	22	26
Sociology	17	14	20	18	13	11	17	10	16	14
Honors course	19	19	19	20	13	26	11	17	12	19
C. Mathematics										
Algebra	97	97	97	97	96	96	96	98	95	96
Geometry	93	93	92	94	85	95	89	92	88	92
Trigonometry	55	59	52	57	43	73	43	43	50	54
Precalculus	28	31	25	29	16	45	18	21	24	25
Calculus	18	21	15	18	9	36	9	12	10	16
Honors course	22	24	21	23	13	34	12	20	15	20

SOURCE: Admissions Testing Program of the College Entrance Examination Board, COLLEGE-BOUND SENIORS, 1988 PROFILE OF SAT AND ACHIEVEMENT TEST TAKERS, (Princeton, N.J.: Educational Testing Service, 1988).

Table 31. Scholastic Aptitutde Test (SAT) scores, by gender and racial/ethnic group: 1978-88

Gender and racial/ethnic group	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
	Verbal scores										
Total	429	427	424	424	426	425	426	431	431	430	428
Male	433	431	428	430	431	430	433	437	437	435	435
Female	425	423	420	418	421	420	420	425	426	425	422
White	446	444	442	442	444	443	445	449	NA	447	445
Black	332	330	330	332	341	339	342	346	NA	351	353
Asian	401	396	396	397	398	395	398	404	NA	405	408
Native American	387	386	390	391	388	388	390	392	NA	393	393
Mexican American	370	370	372	373	377	375	376	382	NA	379	382
Puerto Rican	349	345	350	353	360	358	358	368	NA	360	355
Latin American	NA	NA	NA	NA	NA	NA	NA	NA	NA	387	387
	Mathematics scores										
Total	468	467	466	466	467	468	471	475	475	476	476
Male	494	493	491	492	493	493	495	499	501	500	498
Female	444	443	443	443	443	445	449	452	451	453	455
White	485	483	482	483	483	484	487	490	NA	489	490
Black	354	358	360	362	366	369	373	376	NA	377	384
Asian	510	511	509	513	513	514	519	518	NA	521	522
Native American	419	421	426	425	424	425	427	428	NA	432	435
Mexican American	402	410	413	415	416	417	420	426	NA	424	428
Puerto Rican	388	388	394	398	403	403	405	409	NA	400	402
Latin American	NA	NA	NA	NA	NA	NA	NA	NA	NA	432	433

NA: Not Available

NOTE: Score range is 200 to 800 for each component.

SOURCE: Admissions Testing Program of the College Entrance Examination Board, 1988 PROFILE OF SAT AND ACHIEVEMENT TEST TAKERS (Princeton, N.J.: Educational Testing Service, 1988).

Table 32. Percentile rankings on the Scholastic Aptitude Test, by gender and racial/ethnic group: 1988

Component and score	Total	Male	Female	White	Black	Asian	Native American	Mexican American	Puerto Rican	Latin American
Verbal										
700-800	1	1	1	1	0	1	0	0	0	0
650-699	2	3	2	3	0	3	1	1	0	1
600-649	4	5	4	5	1	5	2	2	1	3
500-599	20	21	18	23	7	17	11	11	8	13
400-499	33	34	33	36	22	26	33	29	23	27
Mathematics										
700-800	4	6	1	4	0	10	1	1	1	1
650-699	5	7	4	6	1	10	2	2	2	3
600-649	8	10	7	9	2	12	4	4	3	5
500-599	25	27	24	28	11	26	20	19	14	19
400-499	29	27	31	30	25	24	33	33	28	29

SOURCE: Admissions Testing Program of the College Entrance Examination Board, 1988 PROFILES OF SAT AND ACHIEVEMENT TEST TAKERS, (Princeton, N.J.: Educational Testing Service, 1988).

Table 33. Achievement test scores in science and mathematics for college-bound seniors, by gender and racial/ethnic group: 1988

Achievement and SAT-M tests	Total	Male	Female	White	Black	Asian	Native American	Mexican American	Puerto Rican	Latin American
Chemistry	577	593	549	578	514	588	542	522	521	556
SAT-M	641	657	613	643	561	654	604	594	574	609
Biology	553	568	539	556	489	554	516	497	519	539
SAT-M	594	618	572	596	513	613	551	531	546	566
Physics	599	611	555	600	528	607	557	535	535	568
SAT-M	662	668	640	667	583	667	617	624	604	622
Mathematics Level I	549	568	531	552	491	575	519	495	504	515
SAT-M (1)	570	594	548	577	498	582	537	496	512	525
Mathematics Level II	664	679	641	664	597	681	630	604	619	640
SAT-M	655	670	630	659	576	658	623	590	603	621

(1) Scores on the mathematics portion of the aptitude test.

NOTE: Score range is 200 to 800.

SOURCE: Admissions Testing Program of the College Entrance Examination Board, 1988 PROFILES OF SAT AND ACHIEVEMENT TEST TAKERS, (Princeton, N.J.: Educational Testing Service, 1988).

Table 34. Advanced Placement test scores in science and mathematics for college-bound seniors, by gender and racial/ethnic group: 1988

Advanced placement test	Total	Male	Female	White	Black	Asian	Native American	Mexican American	Puerto Rican	Latin American
Biology	3.05	3.23	2.87	3.04	2.17	3.39	2.61	2.31	2.72	2.67
Chemistry	2.94	3.09	2.64	2.94	1.99	3.14	2.64	2.42	2.69	2.38
Physics B	2.85	2.96	2.50	2.85	1.97	2.99	2.12	2.10	3.06	2.58
Physics C-Mechanics	3.29	3.42	2.70	3.31	2.34	3.38	3.00	1.98	2.89	2.73
Physics C-Electricity and Magnetism	3.29	3.37	2.86	3.28	2.69	3.34	3.00	2.06	2.50	3.36
Mathematics/Calculus AB	3.10	3.21	2.95	3.11	2.16	3.34	2.74	2.67	2.47	2.77
Mathematics/Calculus BC	3.53	3.63	3.30	3.50	2.98	3.67	2.64	2.59	3.21	3.18
Computer Science AB	2.56	2.65	2.01	2.64	1.81	2.47	2.12	2.13	1.57	2.04
Computer Science A	2.87	2.99	2.24	2.94	1.95	2.88	2.75	2.45	1.75	2.34

NOTE: Score range is from 1 to 5: (a) 1=no recommendation for college credit; (b) 2=possibly qualified; (c) 3=qualified; (d) 4=well qualified; and (e) 5=extremely well qualified.

SOURCE: Advanced Placement Program of the College Entrance Examination Board, 1988 ADVANCED PLACEMENT PROGRAM, NATIONAL SUMMARY REPORTS, (Princeton, N.J.: Educational Testing Service, 1988).

Table 35. Intended undergraduate majors and corresponding SAT mathematics scores of college-bound seniors, by field, gender, and racial/ethnic group: 1988

Area of study	Total	Male	Female	White	Black	Asian	Native American	Mexican American	Puerto Rican	Latin American
	Percent									
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Science and engineering	32.1	38.8	26.2	31.3	33.7	38.5	27.9	34.4	33.8	35.5
Biological science	3.5	3.4	3.6	3.5	2.3	4.7	3.2	3.0	3.4	3.4
Agriculture	1.3	1.7	1.0	1.5	0.4	0.4	1.7	0.9	0.9	0.7
Computer science	3.3	4.3	2.3	2.6	7.5	4.8	3.2	3.9	5.4	4.4
Mathematics	0.7	0.7	0.6	0.7	0.4	0.8	0.6	0.5	0.3	0.4
Physical science	1.4	2.1	0.9	1.6	0.6	1.5	1.0	1.0	0.9	1.0
Social science	11.8	8.7	14.4	12.0	12.0	8.0	10.3	13.1	11.3	13.4
Engineering	10.2	17.8	3.4	9.4	10.5	18.4	8.0	12.0	11.7	12.3
Non-science & engineering (1)	67.9	61.2	73.8	68.7	66.3	61.5	72.1	65.6	66.2	64.5
Business	23.1	23.9	22.3	22.7	26.5	22.7	25.3	22.2	22.9	23.3
Education	6.7	3.2	9.8	7.5	4.1	2.6	7.9	5.9	4.2	4.0
	SAT mathematics score (2)									
Total	---	---	---	---	---	---	---	---	---	---
Science and engineering	---	---	---	---	---	---	---	---	---	---
Biological science	514	527	504	522	418	567	462	459	426	461
Agriculture	447	444	452	451	365	474	427	405	408	422
Computer science	470	502	418	509	371	513	433	425	389	414
Mathematics	596	613	577	608	479	605	535	528	535	534
Physical science	568	583	534	575	448	611	496	503	436	519
Social science	482	513	466	496	389	525	442	429	405	440
Engineering	547	550	535	566	443	570	501	491	452	486
Non-science & engineering (1)	---	---	---	---	---	---	---	---	---	---
Business	462	483	443	476	376	492	431	420	395	423
Education	442	452	439	450	354	465	407	397	380	398

(1) Detail will not add to total because "other" and "undecided" are not included.
(2) Mathematics score on the aptitude portion of the SAT.

SOURCE: Admissions Testing Program of the College Entrance Examination Board, 1988 PROFILES OF SAT AND ACHIEVEMENT TEST TAKERS, (Princeton, N.J.: Educational Testing Service, 1988).

Table 36. Selected characteristics of American freshmen, by gender and racial/ethnic group: 1987

Characteristic	All Freshmen							Freshmen planning a science or engineering major (1)		
	Total	Male	Female	White	Black	Asian	Hispanic	Total	Male	Female
	Percent									
A. Average High School Grade	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1. A-A+	14.5	13.3	15.7	14.5	5.7	27.9	13.6	21.8	21.4	22.3
2. A-	14.3	12.8	15.7	14.6	6.7	21.1	13.5	17.5	17.2	18.1
3. B+	21.3	19.3	23.0	21.5	17.9	21.6	22.3	21.6	21.1	22.2
4. B	21.5	20.6	22.3	21.9	20.5	15.0	21.2	18.1	17.8	18.6
5. B-	14.6	16.7	12.8	14.7	18.6	8.6	14.4	11.6	12.4	10.6
6. Other	13.8	17.3	10.5	12.8	30.6	5.8	15.0	9.4	10.1	8.2
B. Estimated Parental Income	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1. less than $10,000	5.1	4.1	5.9	3.4	18.4	8.7	15.0	4.9	4.1	5.9
2. $10,000-20,000	9.5	8.4	10.5	8.2	19.2	13.3	17.4	9.2	8.7	9.9
3. $20,000-30,000	13.2	12.6	13.8	12.6	17.8	12.6	18.8	12.8	12.5	13.2
4. $30,000-40,000	18.2	17.9	18.5	18.5	15.9	15.6	16.3	17.9	18.3	17.4
5. $40,000-50,000	12.7	13.1	12.3	13.2	9.0	11.1	10.0	13.2	13.9	12.2
6. $50,000 or more	41.3	43.9	39.0	44.1	19.7	38.7	22.5	42.0	42.5	41.4
C. Parent's education										
1. Father	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
a. less than high school	8.2	7.4	9.1	6.7	19.5	10.7	31.3	7.7	7.2	8.4
b. High School graduate	22.0	21.1	22.9	21.5	32.4	12.9	20.6	19.4	19.0	19.9
c. College graduate	23.5	24.2	22.9	24.7	13.7	23.4	12.8	23.3	24.0	22.3
d. Graduate degree	23.4	24.7	22.2	24.0	11.2	36.9	14.9	26.5	26.7	26.2
e. Other	22.9	22.6	22.9	23.1	23.2	16.1	20.4	23.1	23.1	23.2
2. Mother	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
a. less than high school	6.0	5.3	6.7	4.5	13.7	15.3	18.5	5.8	5.5	6.2
b. High School graduate	30.4	30.4	30.4	31.0	29.8	20.0	28.0	27.4	28.0	26.5
c. College graduate	22.4	23.3	21.6	23.1	15.6	26.4	12.3	23.3	23.8	22.6
d. Graduate degree	11.5	11.8	11.1	11.3	11.3	17.8	8.4	13.0	12.6	13.5
e. Other	29.7	29.2	30.2	30.1	29.6	20.5	32.8	30.5	30.1	31.2
D. Highest Degree Planned	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1. bachelor's	31.5	31.4	31.7	33.2	25.9	14.9	25.7	20.4	23.2	16.4
2. master's	39.2	38.5	39.9	39.3	38.2	36.7	37.6	37.5	39.2	35.3
3. Ph.D./Ed.D	13.2	13.8	12.6	12.3	16.6	21.9	15.7	23.3	21.5	25.7
4. Medical	7.0	6.9	7.0	6.3	7.5	18.6	9.9	9.1	7.7	11.2
5. Law	5.4	5.6	5.2	5.3	6.5	4.0	6.2	7.4	6.2	9.1
6. Other	3.7	3.8	3.6	3.6	5.3	3.9	4.9	2.3	2.2	2.3
E. Financial Aid:										
concern about college financing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1. none	37.6	43.1	32.7	39.5	26.6	31.7	22.5	37.7	41.9	32.1
2. some	48.8	45.8	51.5	48.2	51.9	50.5	52.4	48.9	47.0	51.5
3. major	13.6	11.0	15.8	12.3	21.5	17.8	25.1	13.3	11.1	16.4

(1) Data by racial/ethnic group are not reliable for those students whose probable major is a science or engineering field because of very small sample sizes.

SOURCE: Cooperative Institutional Research Program, Graduate School of Education, University of California, Los Angeles, THE AMERICAN FRESHMAN NORM SURVEY, unpublished tabulations.

Table 37. Career choices of American freshmen, by occupation, gender, and racial/ethnic group: 1987

Occupation	All Freshmen							Freshmen planning a science or engineering major (1)		
	Total	Male	Female	White	Black	Asian	Hispanic	Total	Male	Female
	Percent									
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Business Manager	13.3	15.8	11.1	13.2	15.2	11.4	11.9	2.7	3.2	2.2
Business Owner	3.6	5.3	2.1	3.7	3.3	3.0	3.1	0.9	1.2	0.5
Clinical Psychologist	1.7	0.7	2.6	1.7	1.8	1.1	2.4	5.7	1.8	11.0
College Teacher	0.4	0.5	0.4	0.4	0.3	0.4	0.6	0.5	0.5	0.5
Computer Programmer	2.4	3.6	1.4	2.1	5.7	3.1	2.6	5.3	6.5	3.8
Engineer	8.4	14.8	2.8	8.0	9.9	17.1	10.1	28.6	40.8	11.9
Foreign Service Officer	1.4	1.0	1.8	1.4	0.5	1.6	1.8	3.1	1.9	4.7
Lawyer	5.6	5.7	5.5	5.3	7.9	4.5	7.1	8.2	6.7	10.2
Physician	4.8	5.1	4.5	4.0	6.3	17.0	8.8	7.0	6.3	7.9
Science Researcher	1.8	2.1	1.5	1.8	0.8	2.3	1.8	5.8	5.8	5.9
Social Worker	1.1	0.3	1.9	1.1	1.8	0.5	1.4	3.4	0.7	7.1
Statistician	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.2	0.2
Elementary or Secondary School Teacher	8.5	3.6	12.8	9.1	4.7	1.6	5.2	1.6	1.1	2.2
Undecided	12.7	10.7	14.4	13.4	6.5	11.7	10.8	9.1	6.9	12.1
Other	34.2	30.7	37.1	34.7	35.3	24.7	32.4	17.9	16.4	19.8

(1) Data by racial/ethnic group are not reliable for those students whose probable major is a science or engineering field because of very small sample sizes.

SOURCE: Cooperative Institutional Research Program, Graduate School of Education, University of California, Los Angeles, THE AMERICAN FRESHMEN NORM SURVEY, unpublished tabulations.

Table 38. Graduate Record Examination scores by undergraduate major, gender, and racial/ethnic group: 1979 and 1987

Undergraduate major and year	Total	Men	Women	White	Black	Asian	Native American	Mexican American	Puerto Rican	Latin American
					Verbal					
All majors										
1979	488	487	489	511	363	480	459	419	389	465
1987	487	487	487	516	386	476	471	440	389	469
				Students who majored in science or engineering						
Physical sciences										
1979	519	514	534	541	391	495	482	509	418	509
1987	505	504	509	546	422	516	521	490	391	496
Mathematical sciences										
1979	505	510	498	537	364	476	494	420	375	468
1987	483	488	474	537	371	441	500	472	414	468
Biological sciences										
1979	492	485	500	521	358	494	447	407	398	473
1987	504	502	506	527	404	511	479	471	380	494
Behavioral sciences										
1979	507	506	509	528	386	503	483	446	399	481
1987	507	513	504	528	401	504	487	458	401	482
Social sciences										
1979	454	452	457	484	343	453	451	409	363	465
1987	458	461	456	488	358	460	447	421	361	446
Engineering										
1979	468	465	497	527	403	459	478	434	390	476
1987	466	461	492	532	436	451	487	460	401	477
					Quantitative					
All majors										
1979	514	555	478	525	358	566	457	422	418	468
1987	539	585	499	541	390	604	473	456	443	495
				Students who majored in science or engineering						
Physical sciences										
1979	630	640	600	639	462	658	581	600	532	592
1987	639	648	615	645	499	672	602	584	517	615
Mathematical sciences										
1979	665	682	636	682	486	660	671	595	550	626
1987	657	670	635	673	472	658	652	613	573	603
Biological sciences										
1979	555	577	528	569	381	596	479	448	450	509
1987	570	585	558	581	428	612	521	517	456	542
Behavioral sciences										
1979	500	522	479	514	366	528	457	427	387	460
1987	513	539	494	522	382	547	459	446	403	479
Social sciences										
1979	474	501	446	496	337	494	443	413	378	429
1987	479	511	454	495	346	517	439	405	378	436
Engineering										
1979	654	661	603	675	521	675	570	595	583	624
1987	673	675	663	688	579	682	636	626	601	634

Table 38. - continued

Undergraduate major and year	Total	Men	Women	White	Black	Asian	Native American	Mexican American	Puerto Rican	Latin American
	Analytical									
All majors										
1979	503	508	499	529	352	510	457	412	385	460
1987	528	536	522	554	404	537	487	459	421	493
	Students who majored in science or engineering									
Physical sciences										
1979	557	555	564	581	406	546	523	516	433	524
1987	572	568	580	608	468	583	574	529	437	542
Mathematical sciences										
1979	567	568	565	602	401	549	553	467	412	530
1987	588	590	585	639	435	553	615	546	491	546
Biological sciences										
1979	521	518	526	553	359	537	456	421	401	484
1987	557	551	563	582	432	564	510	504	426	528
Behavioral sciences										
1979	511	509	513	535	371	510	468	435	382	473
1987	530	530	530	551	409	531	490	469	418	500
Social sciences										
1979	471	473	469	506	333	464	455	404	362	448
1987	494	495	493	526	379	484	457	431	383	458
Engineering										
1979	526	525	534	587	437	533	505	487	439	520
1987	563	557	601	626	502	554	563	539	491	542

NOTE: Score range is 200 to 800 for each component.

SOURCES: Graduate Record Examination Board, A SUMMARY OF DATA COLLECTED FROM GRADUATE RECORD EXAMINATION TEST-TAKERS DURING 1978-79, DATA SUMMARY REPORT #4 and A SUMMARY OF DATA COLLECTED FROM GRADUATE RECORD EXAMINATION TEST-TAKERS DURING 1986-87, DATA SUMMARY REPORT #12 (Princeton, N.J.: Educational Testing Service).

Table 39. Science and engineering bachelor's degree recipients, by field and gender: 1976-86

Field	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
						Total					
Total, all fields	292,174	288,543	288,167	288,625	291,983	294,867	302,118	307,225	314,666	321,739	323,950
Total science	253,060	246,962	240,756	234,905	232,743	230,799	234,327	234,271	238,135	243,868	246,889
Physical sciences	16,513	16,965	17,172	17,281	17,506	17,481	17,311	16,199	15,834	16,271	15,786
Chemistry	11,107	11,322	11,474	11,643	11,446	11,540	11,316	11,039	10,912	10,701	10,317
Physics	3,544	3,420	3,330	3,338	3,397	3,441	3,475	3,800	3,921	4,111	4,189
Astronomy	166	152	128	120	122	129	113	96	95	119	149
Other	1,696	2,071	2,240	2,180	2,541	2,371	2,407	1,264	906	1,340	1,131
Mathematics	16,085	14,303	12,701	11,901	11,473	11,173	11,708	12,557	13,342	15,267	16,388
Computer sciences	5,664	6,426	7,224	8,769	11,213	15,233	20,431	24,678	32,435	39,121	42,195
Environmental sciences	5,046	5,653	6,003	6,082	6,155	6,694	7,061	7,298	7,925	7,576	6,076
Earth/geological sciences	4,441	4,998	5,416	5,467	5,536	6,110	6,429	6,774	7,285	7,001	5,555
Other	605	655	587	615	619	584	632	524	640	575	521
Life sciences	77,301	78,472	77,138	75,085	71,617	68,086	65,041	63,237	59,613	57,812	56,465
Biological sciences	59,012	58,273	56,111	53,454	50,496	47,920	45,806	44,067	42,310	41,933	41,725
Agricultural sciences	18,289	20,199	21,027	21,631	21,121	20,166	19,235	19,170	17,303	15,879	14,740
Psychology	50,363	47,794	45,057	43,012	42,513	41,364	41,539	40,825	40,375	40,237	40,937
Social sciences	82,088	77,349	75,461	72,775	72,266	70,768	71,236	69,477	68,611	67,584	69,042
Economics	16,025	16,674	17,443	18,150	19,736	20,700	21,880	22,140	22,874	23,073	23,796
Sociology	27,970	24,989	22,991	20,545	19,164	17,582	16,324	14,343	13,320	12,129	12,397
Anthropology	5,267	4,912	4,372	4,083	3,675	3,416	3,149	2,873	2,769	2,684	2,654
Political sciences	28,515	26,576	26,245	25,817	25,658	25,217	25,885	26,020	25,943	26,065	26,661
Other	4,311	4,198	4,410	4,180	4,033	3,853	3,998	4,101	3,705	3,633	3,534
Total engineering	39,114	41,581	47,411	53,720	59,240	64,068	67,791	72,954	76,531	77,871	77,061
Aeronautical/astronautical	1,009	1,078	1,186	1,386	1,424	1,809	2,120	2,127	2,534	2,854	2,902
Chemical	3,203	3,581	4,615	5,655	6,383	6,604	6,814	7,256	7,558	7,222	5,952
Civil	8,059	8,376	9,265	9,941	10,442	10,752	10,570	10,054	9,750	9,208	8,728
Electrical	9,874	10,018	11,213	12,440	13,902	15,040	16,553	18,184	20,059	21,814	23,874
Industrial	2,241	2,264	2,712	2,804	3,217	3,878	4,044	3,824	4,020	4,009	4,255
Mechanical	6,841	7,771	8,924	10,171	11,863	13,388	13,988	15,729	16,691	16,851	16,279
Other	7,887	8,493	9,406	11,323	12,009	12,597	13,702	15,780	15,919	15,913	15,071

Table 39. - continued

Field	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
						Men					
Total, all fields	196,577	191,090	188,107	186,333	186,009	186,425	188,957	191,614	196,650	200,300	200,893
Total science	158,906	151,595	144,193	137,532	132,783	129,474	129,503	128,379	130,952	133,745	135,035
Physical sciences	13,296	13,588	13,479	13,381	13,317	13,167	12,779	11,586	11,177	11,434	11,090
Chemistry	8,610	8,720	8,593	8,530	8,169	8,065	7,703	7,303	7,087	6,807	6,573
Physics	3,156	3,062	2,961	2,939	2,963	3,009	3,014	3,317	3,361	3,550	3,578
Astronomy	149	131	102	100	98	103	92	72	75	89	126
Other	1,381	1,675	1,823	1,812	2,087	1,990	1,970	894	654	988	813
Mathematics	9,531	8,354	7,455	6,943	6,625	6,392	6,650	7,059	7,428	8,231	8,772
Computer sciences	4,540	4,887	5,360	6,306	7,814	10,280	13,316	15,687	20,369	24,690	27,069
Environmental sciences	4,124	4,479	4,709	4,695	4,693	5,028	5,254	5,450	5,991	5,715	4,722
Earth/geological sciences	3,568	3,896	4,185	4,153	4,170	4,550	4,731	5,007	5,477	5,244	4,292
Other	556	583	524	542	523	478	523	443	514	471	430
Life sciences	53,512	52,863	50,184	47,537	44,021	40,610	38,115	36,677	34,253	32,663	31,643
Biological sciences	38,714	37,325	34,574	31,997	29,405	26,898	25,141	23,962	22,653	21,922	21,702
Agricultural sciences	14,798	15,538	15,610	15,540	14,616	13,712	12,974	12,715	11,600	10,741	9,941
Psychology	22,987	20,692	18,517	16,649	15,590	14,447	13,756	13,228	12,949	12,815	12,691
Social sciences	50,916	46,732	44,489	42,021	40,723	39,550	39,633	38,692	38,785	38,197	39,048
Economics	13,032	13,027	13,333	13,383	14,024	14,650	15,037	15,163	15,359	15,400	15,842
Sociology	11,379	9,802	8,423	7,155	6,383	5,357	4,886	4,360	4,275	3,759	3,862
Anthropology	2,225	2,032	1,739	1,580	1,372	1,249	1,149	1,016	1,033	1,021	987
Political sciences	21,310	19,079	18,077	17,197	16,446	15,946	16,026	15,792	15,778	15,765	16,081
Other	2,970	2,792	2,917	2,706	2,498	2,348	2,535	2,361	2,340	2,252	2,276
Total engineering	37,671	39,495	43,914	48,801	53,226	56,951	59,454	63,235	65,698	66,555	65,858
Aeronautical/astronautical	980	1,050	1,125	1,320	1,342	1,680	1,949	1,955	2,350	2,613	2,654
Chemical	2,927	3,152	3,899	4,649	5,168	5,336	5,328	5,618	5,661	5,347	4,483
Civil	7,807	7,943	8,575	8,986	9,451	9,628	9,375	8,728	8,441	7,975	7,582
Electrical	9,681	9,750	10,778	11,781	13,000	13,940	15,142	16,405	18,028	19,392	21,018
Industrial	2,154	2,115	2,389	2,376	2,672	3,111	3,092	2,824	2,949	2,842	2974
Mechanical	6,694	7,535	8,458	9,568	10,981	12,252	12,768	14,284	14,927	15,097	14,602
Other	7,428	7,950	8,690	10,121	10,612	11,004	11,800	13,421	13,333	13,289	12,545

Table 39. - continued

Field	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
						Women					
Total, all fields	95,597	97,453	100,060	102,292	105,974	108,442	113,161	115,611	118,016	121,439	123,057
Total science	94,154	95,367	96,563	97,373	99,960	101,325	104,824	105,892	107,183	110,123	111,854
Physical sciences	3,217	3,377	3,693	3,900	4,189	4,314	4,532	4,613	4,657	4,837	4,696
Chemistry	2,497	2,602	2,881	3,113	3,277	3,475	3,613	3,736	3,825	3,894	3,744
Physics	388	358	369	399	434	432	461	483	560	561	611
Astronomy	17	21	26	20	24	26	21	24	20	30	23
Other	315	396	417	368	454	381	437	370	252	352	318
Mathematics	6,554	5,949	5,246	4,958	4,848	4,781	5,058	5,498	5,914	7,036	7,616
Computer sciences	1,124	1,539	1,864	2,463	3,399	4,953	7,115	8,991	12,066	14,431	15,126
Environmental sciences	922	1,174	1,294	1,387	1,462	1,666	1,807	1,848	1,934	1,861	1,354
Earth/geological sciences	873	1,102	1,231	1,314	1,366	1,560	1,698	1,767	1,808	1,757	1,263
Other	49	72	63	73	96	106	109	81	126	104	91
Life sciences	23,789	25,609	26,954	27,548	27,596	27,476	26,926	26,560	25,360	25,149	24,822
Biological sciences	20,298	20,948	21,537	21,457	21,091	21,022	20,665	20,105	19,657	20,011	20,023
Agricultural sciences	3,491	4,661	5,417	6,091	6,505	6,454	6,261	6,455	5,703	5,138	4,799
Psychology	27,376	27,102	26,540	26,363	26,923	26,917	27,783	27,597	27,426	27,422	28,246
Social sciences	31,172	30,617	30,972	30,754	31,543	31,218	31,603	30,785	29,826	29,387	29,994
Economics	2,993	3,647	4,110	4,767	5,712	6,050	6,843	7,247	7,515	7,673	7,954
Sociology	16,591	15,187	14,568	13,390	12,781	12,225	11,438	9,983	9,045	8,370	8,535
Anthropology	3,042	2,880	2,633	2,503	2,303	2,167	2,000	1,857	1,736	1,663	1,667
Political sciences	7,205	7,497	8,166	8,620	9,212	9,271	9,859	10,228	10,165	10,300	10,580
Other	1,341	1,406	1,493	1,474	1,535	1,505	1,463	1,470	1,365	1,381	1,258
Total engineering	1,443	2,086	3,497	4,919	6,014	7,117	8,337	9,719	10,833	11,316	11,203
Aeronautical/astronautical	29	28	61	66	82	129	171	172	175	241	248
Chemical	276	429	716	1,006	1,215	1,268	1,486	1,638	1,897	1,875	1,469
Civil	252	433	690	955	991	1,124	1,195	1,326	1,309	1,233	1,146
Electrical	193	268	435	659	902	1,100	1,411	1,779	2,031	2,422	2,856
Industrial	87	149	323	428	545	767	952	1,000	1,071	1,167	1281
Mechanical	147	236	466	603	882	1,136	1,220	1,445	1,764	1,754	1,677
Other	459	543	806	1,202	1,397	1,593	1,902	2,359	2,586	2,624	2,526

SOURCE: National Science Foundation, SRS, and National Center for Education Statistics, Department of Education.

Table 40. Science and engineering bachelor's degree recipients, by field and racial/ethnic group: 1977, 1979, 1981, 1985, and 1987

Field (1)	1977	1979	1981	1985	1987
	Total, U.S. citizens and permanent residents (5)				
Total, all fields	383,618	384,318	386,280	392,883	389,290
Sciences, total	337,525	326,315	317,894	305,839	304,156
Physical sciences (2)	22,038	22,659	23,441	22,758	19,027
Mathematical sciences	13,977	11,534	10,717	14,143	15,506
Computer sciences	6,161	8,392	14,455	36,487	35,943
Life sciences	131,430	133,565	128,651	104,350	101,085
Psychology	47,297	42,561	40,878	39,179	41,248
Social sciences (3)	116,622	107,604	99,752	88,922	91,347
Engineering, total (4)	46,093	58,003	68,386	87,044	85,134
	White, non-Hispanic (5)				
Total, all fields	341,726	340,603	338,715	342,814	332,524
Sciences, total	299,654	287,952	277,859	266,509	260,658
Physical sciences (2)	20,417	20,958	21,249	20,541	16,653
Mathematical sciences	12,602	10,229	9,447	12,163	13,265
Computer sciences	5,508	7,404	12,566	31,321	29,181
Life sciences	119,442	120,196	114,320	91,400	86,858
Psychology	41,494	36,648	34,718	33,959	35,761
Social sciences (3)	100,191	92,517	85,559	77,125	78,940
Engineering, total (4)	42,072	52,651	60,856	76,305	71,866
	Black, non-Hispanic (5)				
Total, all fields	22,591	22,123	22,431	21,157	21,345
Sciences, total	21,206	20,348	19,982	18,015	17,925
Physical sciences (2)	692	704	911	830	823
Mathematical sciences	712	652	585	770	834
Computer sciences	361	507	786	2,143	2,820
Life sciences	5,860	6,217	6,253	5,499	5,251
Psychology	3,221	3,218	3,308	2,667	2,451
Social sciences (3)	10,360	9,050	8,139	6,106	5,746
Engineering, total (4)	1,385	1,775	2,449	3,142	3,420

Table 40. - continued

Field (1)	1977	1979	1981	1985	1987
	Asian (5)				
Total, all fields	7,116	8,167	10,339	14,816	18,875
Sciences, total	5,905	6,309	7,273	9,809	12,497
Physical sciences (2)	377	439	599	763	894
Mathematical sciences	316	324	392	885	1,034
Computer sciences	163	263	669	2,044	2,455
Life sciences	2,578	2,875	3,119	3,222	4,107
Psychology	807	781	843	845	1,154
Social sciences (3)	1,664	1,627	1,651	2,050	2,853
Engineering, total (4)	1,211	1,858	3,066	5,007	6,376
	Native American (5)				
Total, all fields	1,309	1,393	1,411	1,691	1,568
Sciences, total	1,174	1,229	1,216	1,382	1,285
Physical sciences (2)	68	63	65	98	72
Mathematical sciences	26	41	18	59	52
Computer sciences	15	11	21	139	112
Life sciences	424	439	442	438	420
Psychology	167	177	196	201	180
Social sciences (3)	474	498	474	447	449
Engineering, total (4)	135	164	195	309	283
	Hispanic (5)				
Total, all fields	10,876	12,032	13,384	12,405	14,978
Sciences, total	9,586	10,477	11,564	10,124	11,791
Physical sciences (2)	484	495	617	526	585
Mathematical sciences	321	288	275	266	321
Computer sciences	114	207	413	840	1,375
Life sciences	3,126	3,838	4,517	3,791	4,449
Psychology	1,608	1,737	1,813	1,507	1,702
Social sciences (3)	3,933	3,912	3,929	3,194	3,359
Engineering, total (4)	1,290	1,555	1,820	2,281	3,187

(1) Data on racial/ethnic group are collected by broad fields of study only; therefore, these data cannot be adjusted to the exact field taxonomies used by NSF.

(2) Includes environmental sciences.

(3) For 1977 to 1981, social sciences included "Afro-American black cultural studies" and "American Indian studies."

(4) Includes engineering technology. Racial/ethnic data for engineering and engineering technology can only be seperated for 1985 and 1987.

(5) Racial/ethnic categories are designated on the survey form. Data are provided by institutions. These categories include U.S. citizens and foreign citizens on permanent visas; data are not available by racial/ethnic groups for foreign citizens on temporary visas.

NOTES: (A) Data by racial/ethnic group are collected on a biennial schedule.
(B) Imputations were done for racial/ethnic group nonresponse by field for 1977 through 1985 but not for 1987. Nonresponse for race/ethnicity was 11,075 in 1987.

SOURCE: National Science Foundation, SRS, and National Center for Education Statistics, Department of Education.

Table 41. Graduate enrollment in science and engineering, by field and gender: 1980, 1982, and 1988

Field	Total			Men			Women		
	1980	1982	1988	1980	1982	1988	1980	1982	1988
Total, all fields	340,740	354,717	393,580	237,205	240,868	260,170	103,535	113,849	133,410
Sciences, total	265,656	270,123	289,520	168,624	165,247	169,482	97,032	104,876	120,038
Physical sciences	26,952	28,199	33,047	22,352	22,776	25,535	4,600	5,423	7,512
Chemistry	16,222	17,015	18,632	12,718	12,855	13,166	3,504	4,160	5,466
Physics	9,898	10,306	13,312	8,950	9,238	11,561	948	1,068	1,751
Other physical sciences	832	878	1,103	684	683	808	148	195	295
Mathematical sciences	15,360	17,199	19,044	11,272	12,109	13,255	4,088	5,090	5,789
Computer sciences	13,578	19,812	32,961	10,491	14,366	24,629	3,087	5,446	8,332
Environmental sciences	14,208	15,174	14,128	10,940	11,393	10,247	3,268	3,781	3,881
Geosciences	8,668	9,621	8,563	6,743	7,318	6,451	1,925	2,303	2,112
Oceanography	1,992	2,091	2,033	1,505	1,514	1,388	487	577	645
Atmospheric sciences	889	889	940	779	764	777	110	125	163
Other environmental sciences	2,659	2,573	2,592	1,913	1,797	1,631	746	776	961
Life sciences	60,144	58,624	59,330	38,939	36,335	34,706	21,205	22,289	24,624
Biological sciences	47,890	46,310	48,322	29,492	27,021	26,761	18,398	19,289	21,561
Agricultural sciences	12,254	12,314	11,008	9,447	9,314	7,945	2,807	3,000	3,063
Psychology	40,636	40,098	44,605	19,036	16,980	15,875	21,600	23,118	28,730
Social sciences	94,778	91,017	86,405	55,594	51,288	45,235	39,184	39,729	41,170
Economics	13,132	13,735	12,329	10,126	10,237	9,067	3,006	3,498	3,262
Sociology	8,001	7,246	7,035	3,984	3,376	3,227	4,017	3,870	3,808
Other social sciences	73,645	70,036	67,041	41,484	37,675	32,941	32,161	32,361	34,100
Engineering, total	75,084	84,594	104,060	68,581	75,621	90,688	6,503	8,973	13,372
Aeronautical/astronautical	1,737	1,941	3,318	1,663	1,831	3,086	74	110	232
Chemical	6,015	7,189	6,618	5,336	6,288	5,543	679	901	1,075
Civil	13,502	14,523	15,056	11,973	12,614	12,683	1,529	1,909	2,373
Electrical	19,227	22,017	32,232	18,244	20,466	28,928	983	1,551	3,304
Industrial	9,870	9,870	12,036	8,520	8,216	9,788	1,350	1,654	2,248
Mechanical	9,888	11,467	16,216	9,354	10,748	14,795	534	719	1,421
Other engineering	14,845	17,587	18,584	13,491	15,458	15,865	1,354	2,129	2,719

SOURCE: National Science Foundation, SRS.

Table 42. Graduate enrollment in science and engineering, by field and racial/ethnic group: 1982 and 1988

(U.S. citizens only)

Field	Total (1)		White, non-Hispanic		Black, non-Hispanic		Asian		Native American		Hispanic	
	1982	1988	1982	1988	1982	1988	1982	1988	1982	1988	1982	1988
Total, all fields	289,342	299,683	226,704	242,573	11,657	12,341	8,379	16,169	1,006	1,024	8,405	9,967
Sciences, total	229,957	230,707	183,328	189,682	10,513	10,791	5,632	9,771	835	879	7,304	8,232
Physical sciences	21,254	21,973	17,689	18,313	553	569	697	1,249	50	52	496	626
Mathematical sciences	12,668	12,670	10,158	10,139	357	432	492	751	42	32	290	333
Computer sciences	15,439	23,883	11,574	17,771	528	830	890	2,711	31	40	249	520
Environmental sciences	13,290	11,724	11,393	10,643	103	108	208	220	22	29	191	224
Life sciences	50,406	46,683	43,347	40,350	1,273	1,303	1,269	2,106	117	151	1,020	1,415
Psychology	38,704	42,941	30,321	36,129	1,643	1,956	441	755	139	178	1,471	1,751
Social sciences	78,196	70,833	58,846	56,337	6,056	5,593	1,635	1,979	434	397	3,587	3,363
Engineering, total	59,385	68,976	43,376	52,891	1,144	1,550	2,747	6,398	171	145	1,101	1,735
Chemical	4,659	4,103	3,850	3,382	85	84	312	334	14	24	101	135
Civil	9,638	9,174	7,103	7,462	139	198	410	649	22	22	221	288
Electrical	15,715	22,051	10,597	15,381	303	514	794	2,816	59	38	317	526
Industrial	7,905	9,267	5,948	7,632	250	300	288	476	19	15	175	278
Mechanical	7,407	10,326	5,333	7,863	100	200	336	912	14	12	113	217
Other engineering	14,061	14,055	10,545	11,171	267	254	607	1,211	43	34	174	291

(1) Total includes "other" and "unknown" racial/ethnic background.

NOTE: Data are not collected on the racial/ethnic backgrounds of foreign citizens.
SOURCE: National Science Foundation, SRS.

Table 43. Median elapsed time between baccalaureate and completion of doctorate in science and engineering, by field, year of doctorate, and gender: 1978-88
(in years)

Field	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Total											
Total, all fields	7.5	7.5	7.6	7.6	7.8	8.0	8.2	8.3	8.4	8.5	8.5
Sciences, total	7.5	7.5	7.6	7.6	7.8	8.0	8.2	8.4	8.5	8.6	8.6
Physical sciences	6.7	6.4	6.5	6.4	6.5	6.6	6.7	6.8	6.8	6.8	6.8
Mathematics	7.1	7.1	7.0	6.9	7.0	7.4	7.7	7.8	7.3	7.9	8.0
Computer sciences	7.8	7.5	7.4	7.7	7.7	8.5	8.8	8.9	9.1	9.0	9.5
Earth, atmospheric, and and marine sciences	7.9	7.6	8.1	8.3	8.3	8.4	8.8	8.8	9.0	9.0	9.3
Life sciences	7.2	7.2	7.1	7.1	7.3	7.6	7.9	8.0	8.3	8.3	8.4
Psychology	7.4	7.7	7.9	8.4	8.6	8.9	9.3	9.4	9.7	9.9	10.1
Social sciences	8.8	9.3	9.3	9.4	9.6	9.8	9.9	10.4	10.1	10.7	10.5
Engineering, total	7.5	7.6	7.6	7.9	8.0	8.0	8.0	8.1	8.1	8.1	8.1
Chemical	6.6	5.9	6.5	6.6	6.9	6.7	6.7	6.8	6.8	6.7	6.7
Civil	7.9	8.3	8.4	8.4	8.5	8.5	8.5	8.7	8.7	9.2	8.9
Electrical	7.0	7.6	7.3	7.5	7.7	7.8	8.0	7.9	7.9	7.7	7.8
Mechanical	8.1	7.5	7.9	7.9	8.2	8.3	7.8	8.1	8.2	8.1	8.5
Men											
Total, all fields	7.4	7.4	7.5	7.5	7.7	7.9	8.1	8.2	8.3	8.3	8.3
Sciences, total	7.4	7.3	7.4	7.4	7.6	7.9	8.1	8.2	8.3	8.4	8.4
Physical sciences	6.8	6.3	6.5	6.4	6.5	6.6	6.7	6.8	6.9	6.9	6.9
Mathematics	7.1	7.0	6.9	6.9	7.0	7.3	7.7	7.8	7.2	7.7	7.9
Computer sciences	7.9	7.3	7.3	7.7	7.6	8.4	8.7	8.7	9.1	9.0	9.3
Earth, atmospheric, and and marine sciences	7.9	7.7	8.1	8.4	8.4	8.5	8.9	8.8	8.9	9.1	9.4
Life sciences	7.1	7.2	7.1	7.1	7.3	7.6	7.9	8.0	8.3	8.4	8.4
Psychology	7.3	7.5	7.7	8.2	8.3	8.8	9.1	9.3	9.6	9.9	9.9
Social sciences	8.6	9.0	9.2	9.2	9.5	9.6	9.6	10.0	9.9	10.4	10.3
Engineering, total	7.5	7.6	7.7	7.9	8.0	8.0	8.0	8.2	8.2	8.2	8.2
Chemical	6.6	5.9	6.6	6.6	7.0	6.7	6.7	6.9	6.9	6.6	6.8
Civil	8.0	8.3	8.4	8.4	8.4	8.5	8.6	8.7	8.7	9.2	8.9
Electrical	7.0	7.6	7.3	7.5	7.7	7.8	8.0	7.9	7.9	7.8	7.9
Mechanical	8.1	7.5	8.0	7.9	8.2	8.3	7.9	8.2	8.3	8.1	8.5
Women											
Total, all fields	7.8	7.9	8.0	8.1	8.2	8.5	8.6	8.8	9.0	9.0	9.0
Sciences, total	7.8	7.9	8.0	8.1	8.2	8.5	8.7	8.9	9.1	9.1	9.1
Physical sciences	6.5	6.5	6.1	6.4	6.4	6.6	6.5	6.6	6.5	6.6	6.5
Mathematics	7.2	7.2	8.2	7.3	7.6	7.5	7.9	7.6	8.0	9.4	8.6
Computer sciences	(1)	8.6	8.3	7.8	10.0	10.0	11.0	11.5	9.3	9.3	11.1
Earth, atmospheric, and and marine sciences	7.5	7.1	8.0	7.6	7.7	8.0	8.7	8.7	9.3	8.4	9.1
Life sciences	7.4	7.2	7.2	7.2	7.3	7.6	7.9	8.2	8.3	8.3	8.4
Psychology	7.6	8.0	8.3	8.6	9.0	9.2	9.4	9.5	9.9	9.9	10.3
Social sciences	9.4	10.1	9.7	9.8	10.1	10.2	10.5	11.3	10.6	11.2	11.2
Engineering, total	7.4	6.9	6.6	7.1	7.6	7.7	7.3	7.1	7.6	7.3	7.0
Chemical	(1)	(1)	(1)	(1)	(1)	6.5	6.2	6.3	6.4	6.9	6.1
Civil	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	7.0
Electrical	(1)	(1)	(1)	(1)	(1)	(1)	(1)	7.4	8.5	6.1	6.7
Mechanical	(1)	(1)	(1)	(1)	(1)	(1)	(1)	6.7	(1)	(1)	7.8

(1) Too few case to estimate.

SOURCE: National Science Foundation, SRS.

Table 44. Science and engineering master's degree recipients, by field and gender: 1976-86

Field	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
	Total										
Total, all fields	54,747	56,731	56,237	54,456	54,391	54,811	57,025	58,868	59,569	61,278	62,526
Sciences, total	38,577	39,842	39,222	38,263	37,545	37,438	38,431	39,147	39,217	40,072	41,212
Physical sciences	3,904	3,686	3,744	3,687	3,440	3,424	3,514	3,329	3,586	3,642	3,676
Chemistry	1,796	1,775	1,892	1,765	1,733	1,667	1,758	1,632	1,677	1,734	1,764
Physics	1,451	1,319	1,294	1,319	1,192	1,294	1,284	1,370	1,535	1,523	1,501
Astronomy	89	81	95	116	79	58	80	68	67	91	83
Other physical sciences	568	511	463	487	436	405	392	259	307	294	328
Mathematics	3,863	3,698	3,383	3,046	2,868	2,569	2,731	2,839	2,749	2,888	3,171
Computer sciences	2,603	2,798	3,038	3,055	3,647	4,218	4,935	5,321	6,190	7,101	8,070
Environmental sciences	1,581	1,659	1,832	1,777	1,793	1,876	2,012	1,959	1,982	2,160	2,234
Earth/geological sciences	1,232	1,300	1,456	1,435	1,481	1,527	1,682	1,673	1,617	1,806	1,895
Other environmental sciences	349	359	376	342	312	349	330	286	365	354	339
Life sciences	9,823	10,707	10,711	10,719	10,278	9,731	9,824	9,720	9,330	8,757	8,572
Biological sciences	6,939	7,468	7,227	7,220	6,854	6,299	6,184	6,041	5,717	5,345	5,289
Agricultural sciences	2,884	3,239	3,484	3,499	3,424	3,432	3,640	3,679	3,613	3,412	3,283
Psychology	7,859	8,320	8,194	8,031	7,861	8,039	7,849	8,439	8,073	8,481	8,363
Social sciences	8,944	8,974	8,320	7,948	7,658	7,581	7,566	7,540	7,307	7,043	7,126
Economics	2,560	2,662	2,549	2,468	2,386	2,498	2,506	2,568	2,482	2,532	2,496
Sociology	2,010	1,830	1,611	1,415	1,341	1,240	1,154	1,112	1,008	1,022	965
Anthropology	969	994	881	867	861	892	849	815	779	771	746
Political sciences	2,192	2,223	2,070	2,038	1,938	1,876	1,955	1,829	1,770	1,500	1,704
Other social sciences	1,213	1,265	1,209	1,160	1,132	1,075	1,102	1,216	1,268	1,218	1,215
Engineering, total	16,170	16,889	17,015	16,193	16,846	17,373	18,594	19,721	20,352	21,206	21,314
Aeronautical/astronautical	479	385	411	372	382	408	521	491	562	605	621
Chemical	1,031	1,086	1,237	1,149	1,271	1,268	1,287	1,371	1,517	1,549	1,367
Civil	3,000	2,969	2,691	2,655	2,683	2,894	2,998	3,082	3,151	3,174	2,928
Electrical	3,774	3,788	3,742	3,596	3,842	3,902	4,465	4,532	5,079	5,154	5,535
Industrial	1,751	1,609	1,722	1,502	1,313	1,631	1,656	1,432	1,557	1,463	1,653
Mechanical	1,907	1,953	1,943	1,878	2,060	2,293	2,399	2,511	2,707	3,053	3,076
Other	4,228	5,099	5,269	5,041	5,295	4,977	5,268	6,302	5,689	6,208	6,134

Table 44. - continued

Field	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
						Men					
Total, all fields	42,675	43,577	42,547	40,416	40,008	39,797	41,049	41,787	41,894	42,980	43,344
Sciences, total	27,094	27,421	26,403	25,213	24,352	23,830	24,139	23,942	23,701	24,102	24,501
Physical sciences	3,299	3,025	3,088	3,005	2,801	2,743	2,765	2,636	2,736	2,811	2,759
Chemistry	1,413	1,327	1,447	1,318	1,286	1,194	1,261	1,167	1,139	1,166	1,165
Physics	1,319	1,193	1,171	1,184	1,074	1,179	1,128	1,208	1,341	1,333	1,277
Astronomy	81	67	83	101	70	49	69	56	57	76	72
Other physical sciences	486	438	387	402	371	321	307	205	199	236	245
Mathematics	2,550	2,398	2,233	1,989	1,832	1,692	1,821	1,859	1,795	1,877	2,055
Computer sciences	2,226	2,332	2,471	2,480	2,883	3,247	3,625	3,813	4,379	5,064	5,658
Environmental sciences	1,361	1,433	1,542	1,467	1,457	1,470	1,560	1,515	1,517	1,639	1,717
Earth/geological sciences	1,046	1,109	1,199	1,165	1,186	1,175	1,301	1,279	1,216	1,361	1,444
Other environmental sciences	315	324	343	302	271	295	259	236	301	278	273
Life sciences	7,204	7,696	7,485	7,259	6,952	6,451	6,315	6,111	5,728	5,266	5,022
Biological sciences	4,746	4,956	4,695	4,510	4,325	3,853	3,621	3,421	3,167	2,810	2,742
Agricultural sciences	2,458	2,740	2,790	2,749	2,627	2,598	2,694	2,690	2,561	2,456	2,280
Psychology	4,188	4,316	3,931	3,688	3,397	3,371	3,228	3,254	2,980	3,064	2,937
Social sciences	6,266	6,221	5,653	5,325	5,030	4,856	4,825	4,754	4,566	4,381	4,353
Economics	2,174	2,231	2,091	2,018	1,907	1,941	1,913	1,957	1,891	1,920	1,880
Sociology	1,166	1,018	878	745	667	590	525	485	456	456	429
Anthropology	497	518	440	420	388	374	421	372	324	325	318
Political sciences	1,719	1,719	1,523	1,480	1,423	1,342	1,345	1,286	1,233	1,062	1,154
Other social sciences	710	735	721	662	645	609	621	654	662	618	572
Engineering, total	15,581	16,156	16,144	15,203	15,656	15,967	16,910	17,845	18,193	18,878	18,843
Aeronautical/astronautical	469	377	400	355	373	388	482	454	535	574	578
Chemical	992	1,021	1,150	1,035	1,138	1,105	1,106	1,207	1,323	1,281	1,153
Civil	2,901	2,840	2,559	2,512	2,466	2,687	2,728	2,787	2,825	2,837	2,628
Electrical	3,670	3,654	3,600	3,453	3,658	3,681	4,177	4,239	4,694	4,720	4,979
Industrial	1,670	1,534	1,584	1,374	1,180	1,465	1,446	1,226	1,279	1,236	1,374
Mechanical	1,880	1,904	1,886	1,811	1,962	2,177	2,260	2,362	2,613	2,848	2,839
Other	3,999	4,826	4,965	4,663	4,859	4,464	4,711	5,570	4,924	5,382	5,292

Table 44. - continued

Field	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
	Women										
Total, all fields	12,072	13,154	13,690	14,040	14,383	15,014	15,976	17,081	17,675	18,298	19,182
Sciences, total	11,483	12,421	12,819	13,050	13,193	13,608	14,292	15,205	15,516	15,970	16,711
Physical sciences	605	661	656	682	639	681	749	693	850	831	917
Chemistry	383	448	445	447	447	473	497	465	538	568	599
Physics	132	126	123	135	118	115	156	162	194	190	224
Astronomy	8	14	12	15	9	9	11	12	10	15	11
Other physical sciences	82	73	76	85	65	84	85	54	108	58	83
Mathematics	1,313	1,300	1,150	1,057	1,036	877	910	980	954	1,011	1,116
Computer sciences	377	466	567	575	764	971	1,310	1,508	1,811	2,037	2,412
Environmental sciences	220	226	290	310	336	406	452	444	465	521	517
Earth/geological sciences	186	191	257	270	295	352	381	394	401	445	451
Other environmental sciences	34	35	33	40	41	54	71	50	64	76	66
Life sciences	2,619	3,011	3,226	3,460	3,326	3,280	3,509	3,609	3,602	3,491	3,550
Biological sciences	2,193	2,512	2,532	2,710	2,529	2,446	2,563	2,620	2,550	2,535	2,547
Agricultural sciences	426	499	694	750	797	834	946	989	1,052	956	1,003
Psychology	3,671	4,004	4,263	4,343	4,464	4,668	4,621	5,185	5,093	5,417	5,426
Social sciences	2,678	2,753	2,667	2,623	2,628	2,725	2,741	2,786	2,741	2,662	2,773
Economics	386	431	458	450	479	557	593	611	591	612	616
Sociology	844	812	733	670	674	650	629	627	552	566	536
Anthropology	472	476	441	447	473	518	428	443	455	446	428
Political sciences	473	504	547	558	515	534	610	543	537	438	550
Other social sciences	503	530	488	498	487	466	481	562	606	600	643
Engineering, total	589	733	871	990	1,190	1,406	1,684	1,876	2,159	2,328	2,471
Aeronautical/astronautical	10	8	11	17	9	20	39	37	27	31	43
Chemical	39	65	87	114	133	163	181	164	194	268	214
Civil	99	129	132	143	197	207	270	295	326	337	300
Electrical	104	134	142	143	184	221	288	293	385	434	556
Industrial	81	75	138	128	133	166	210	206	278	227	279
Mechanical	27	49	57	67	98	116	139	149	184	205	237
Other	229	273	304	378	436	513	557	732	765	826	842

SOURCE: National Science Foundation and National Center for Education Statistics, Department of Education.

Table 45. Science and engineering master's degree recipients, by field and racial/ethnic group: 1977, 1979, 1981, 1985, and 1987

Field (1)	1977	1979	1981	1985	1987
	Total, U.S. citizens and permanent residents (5)				
Total, all fields	67,633	65,204	64,698	64,604	64,718
Sciences, total	54,938	53,787	52,896	49,704	48,771
Physical sciences (2)	4,689	4,713	4,457	4,563	4,271
Mathematical sciences	3,328	2,571	2,103	2,146	2,331
Computer sciences	2,432	2,528	3,239	5,233	5,848
Life sciences	22,327	24,700	24,941	21,234	20,961
Psychology	8,149	7,852	7,769	8,129	7,493
Social sciences (3)	14,013	11,423	10,387	8,399	7,867
Engineering, total (4)	12,695	11,417	11,802	14,900	15,947
	White, non-Hispanic (5)				
Total, all fields	60,890	58,616	57,610	56,479	56,166
Sciences, total	49,446	48,534	47,463	43,900	42,927
Physical sciences (2)	4,363	4,373	4,115	4,133	3,834
Mathematical sciences	3,048	2,352	1,890	1,873	2,012
Computer sciences	2,208	2,273	2,818	4,303	4,717
Life sciences	20,262	22,340	22,471	19,038	18,687
Psychology	7,201	7,078	7,019	7,220	6,698
Social sciences (3)	12,364	10,118	9,150	7,333	6,979
Engineering, total (4)	11,444	10,082	10,147	12,579	13,239
	Black, non-Hispanic (5)				
Total, all fields	2,923	2,789	2,676	2,408	2,446
Sciences, total	2,683	2,543	2,416	2,049	2,013
Physical sciences (2)	94	86	107	89	79
Mathematical sciences	133	71	67	53	73
Computer sciences	67	65	70	180	207
Life sciences	914	1,097	1,133	879	888
Psychology	506	476	424	426	376
Social sciences (3)	969	748	615	422	390
Engineering, total (4)	240	246	260	359	433

Table 45. - continued

Field (1)	1977	1979	1981	1985	1987
	Asian (5)				
Total, all fields	2,042	2,268	2,580	3,703	3,891
Sciences, total	1,305	1,418	1,501	2,130	2,199
Physical sciences (2)	142	160	153	213	227
Mathematical sciences	90	104	97	164	183
Computer sciences	108	149	279	615	779
Life sciences	595	682	660	681	663
Psychology	95	87	77	129	113
Social sciences (3)	275	236	235	328	234
Engineering, total (4)	737	850	1,079	1,573	1,692
	Native American (5)				
Total, all fields	193	222	213	277	222
Sciences, total	170	198	182	228	159
Physical sciences (2)	21	29	11	21	9
Mathematical sciences	12	8	7	7	3
Computer sciences	3	16	12	41	22
Life sciences	72	80	76	79	68
Psychology	26	20	32	37	35
Social sciences (3)	36	45	44	43	22
Engineering, total (4)	23	24	31	49	63
	Hispanic (5)				
Total, all fields	1,585	1,309	1,619	1,737	1,993
Sciences, total	1,334	1,094	1,334	1,397	1,473
Physical sciences (2)	69	65	71	107	122
Mathematical sciences	45	36	42	49	60
Computer sciences	46	25	60	94	123
Life sciences	484	501	601	557	655
Psychology	321	191	217	317	271
Social sciences (3)	369	276	343	273	242
Engineering, total (4)	251	215	285	340	520

(1) Data on racial/ethnic group are collected by broad fields of study only; therefore, these data cannot be adjusted to the exact field taxonomies used by NSF.

(2) Includes environmental sciences.

(3) For 1977 to 1981, social sciences included "Afro-American black cultural studies" and "American Indian studies."

(4) Includes engineering technology. Racial/ethnic data for engineering and engineering technology can only be separated for 1985 and 1987.

(5) Racial/ethnic categories are designated on the survey form. Data are provided by institutions. These categories include U.S. citizens and foreign citizens on permanent visas; data are not available by racial/ethnic groups for foreign citizens on temporary visas.

NOTES: (A) Data by racial/ethnic group are collected on a biennial schedule.
(B) Imputations were done for racial/ethnic group nonresponse by field for 1977 through 1985 but not for 1987. Nonresponse for race/ethnicity was 4,070 in 1987.

SOURCE: National Science Foundation, SRS, and National Center for Education Statistics, Department of Education.

Table 46. Science and engineering doctorate recipients, by field and gender: 1978-88

Field	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
						Total					
Total, all fields	17,048	17,245	17,199	17,633	17,630	17,976	18,107	18,323	18,859	19,312	20,257
Sciences, total	14,625	14,755	14,720	15,105	14,984	15,195	15,194	15,157	15,483	15,600	16,067
Physical sciences	2,611	2,674	2,521	2,627	2,694	2,802	2,845	2,916	3,090	3,212	3,320
Chemistry	1,544	1,566	1,538	1,612	1,680	1,759	1,765	1,836	1,903	1,975	2,018
Physics	929	993	862	906	912	928	982	980	1,078	1,137	1,172
Astronomy	138	115	121	109	102	115	98	100	109	100	130
Mathematics	838	769	744	728	720	701	698	688	729	740	749
Computer sciences	121	210	218	232	220	286	295	310	399	450	514
Earth, atmospheric, and marine sciences	623	646	628	583	657	637	614	617	589	628	726
Life sciences	4,369	4,501	4,715	4,786	4,844	4,756	4,877	4,902	4,806	4,813	5,121
Biological sciences	3,516	3,646	3,803	3,804	3,893	3,741	3,880	3,791	3,808	3,836	4,106
Agricultural sciences	853	855	912	982	951	1,015	997	1,111	998	977	1,015
Psychology	3,055	3,091	3,098	3,358	3,159	3,347	3,257	3,117	3,124	3,177	3,058
Social sciences	3,008	2,864	2,796	2,791	2,690	2,666	2,608	2,607	2,746	2,580	2,579
Economics	960	956	927	993	940	970	952	959	1,018	959	1,007
Sociology	610	632	601	605	568	525	515	461	492	423	449
Anthropology	431	418	396	397	354	403	366	377	409	383	348
Political sciences	603	522	505	445	459	397	419	406	414	404	391
Other social sciences	404	336	367	351	369	371	356	404	413	411	384
Engineering, total	2,423	2,490	2,479	2,528	2,646	2,781	2,913	3,166	3,376	3,712	4,190
Aeronautical/astronautical	103	81	81	97	86	106	119	124	118	142	150
Chemical	261	287	285	296	306	349	361	440	476	528	625
Civil	236	236	240	287	308	354	351	358	387	441	489
Electrical	463	533	478	478	544	517	593	631	706	691	885
Industrial	51	82	77	66	79	86	84	92	101	120	127
Mechanical	282	281	293	282	334	311	336	424	442	543	611
Other engineering	1,027	990	1,025	1,022	989	1,058	1,069	1,097	1,146	1,247	1,303

Table 46. - continued

Field	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
						Men					
Total, all fields	13,735	13,662	13,398	13,610	13,485	13,481	13,520	13,641	13,917	14,209	14,875
Sciences, total	11,365	11,234	11,009	11,181	10,963	10,824	10,758	10,673	10,766	10,739	10,971
Physical sciences	2,364	2,382	2,199	2,318	2,337	2,431	2,446	2,452	2,585	2,686	2,761
Chemistry	1,349	1,347	1,283	1,376	1,407	1,462	1,445	1,474	1,507	1,569	1,589
Physics	884	928	808	844	844	869	915	889	978	1,030	1,058
Astronomy	131	107	108	98	86	100	86	89	100	87	114
Mathematics	718	650	649	616	624	588	583	582	608	615	628
Computer sciences	110	183	197	206	200	250	258	277	351	385	458
Earth, atmospheric, and marine sciences	562	588	564	527	554	540	508	506	489	514	582
Life sciences	3,411	3,470	3,565	3,565	3,552	3,390	3,529	3,494	3,354	3,284	3,434
Biological sciences	2,623	2,695	2,750	2,717	2,752	2,508	2,665	2,554	2,528	2,478	2,605
Agricultural sciences	788	775	815	848	800	882	864	940	826	806	829
Psychology	1,928	1,831	1,787	1,885	1,721	1,750	1,626	1,576	1,526	1,478	1,383
Social sciences	2,272	2,130	2,048	2,064	1,975	1,875	1,808	1,786	1,853	1,777	1,725
Economics	862	840	811	879	820	819	799	814	837	796	809
Sociology	386	400	370	363	354	309	289	227	276	255	211
Anthropology	252	238	208	232	203	209	175	187	198	185	171
Political sciences	485	427	403	349	353	314	322	299	297	293	296
Other social sciences	287	225	256	241	245	224	223	259	245	248	238
Engineering, total	2,370	2,428	2,389	2,429	2,522	2,657	2,762	2,968	3,151	3,470	3,904
Aeronautical/astronautical	102	81	80	97	85	104	117	119	117	132	141
Chemical	256	279	271	285	289	327	336	405	423	472	565
Civil	230	234	234	281	296	342	332	340	368	424	464
Electrical	451	525	466	464	525	510	579	603	673	661	847
Industrial	49	77	70	60	73	80	68	86	87	107	108
Mechanical	280	277	289	277	322	305	330	402	428	529	585
Other engineering	1,002	955	979	965	932	989	1,000	1,013	1,055	1,145	1,194

Table 46. - continued

Field	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
	Women										
Total, all fields	3,313	3,583	3,801	4,023	4,145	4,495	4,587	4,682	4,942	5,103	5,382
Sciences, total	3,260	3,521	3,711	3,924	4,021	4,371	4,436	4,484	4,717	4,861	5,096
Physical sciences	247	292	322	309	357	371	399	464	505	526	559
Chemistry	195	219	255	236	273	297	320	362	396	406	429
Physics	45	65	54	62	68	59	67	91	100	107	114
Astronomy	7	8	13	11	16	15	12	11	9	13	16
Mathematics	120	119	95	112	96	113	115	106	121	125	121
Computer sciences	11	27	21	26	20	36	37	33	48	65	56
Earth, atmospheric, and marine sciences	61	58	64	56	103	97	106	111	100	114	144
Life sciences	958	1,031	1,150	1,221	1,292	1,366	1,348	1,408	1,452	1,529	1,687
Biological sciences	893	951	1,053	1,087	1,141	1,233	1,215	1,237	1,280	1,358	1,501
Agricultural sciences	65	80	97	134	151	133	133	171	172	171	186
Psychology	1,127	1,260	1,311	1,473	1,438	1,597	1,631	1,541	1,598	1,699	1,675
Social sciences	736	734	748	727	715	791	800	821	893	803	854
Economics	98	116	116	114	120	151	153	145	181	163	198
Sociology	224	232	231	242	214	216	226	234	216	168	238
Anthropology	179	180	188	165	151	194	191	190	211	198	177
Political sciences	118	95	102	96	106	83	97	107	117	111	95
Other social sciences	117	111	111	110	124	147	133	145	168	163	146
Engineering, total	53	62	90	99	124	124	151	198	225	242	286
Aeronautical/astronautical	1	0	1	0	1	2	2	5	1	10	9
Chemical	5	8	14	11	17	22	25	35	53	56	60
Civil	6	2	6	6	12	12	19	18	19	17	25
Electrical	12	8	12	14	19	7	14	28	33	30	38
Industrial	2	5	7	6	6	6	16	6	14	13	19
Mechanical	2	4	4	5	12	6	6	22	14	14	26
Other engineering	25	35	46	57	57	69	69	84	91	102	109

SOURCE: National Science Foundation, SRS.

Table 47. Science and engineering doctorate recipients, by field, citizenship, gender, and racial/ethnic group: 1978-88

Field, gender, and racial/ethnic group	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
	Total, all degree recipients(1)										
Total, all fields	17,048	17,245	17,199	17,633	17,630	17,976	18,107	18,323	18,859	19,312	20,257
Men	13,735	13,662	13,398	13,610	13,485	13,481	13,520	13,641	13,917	14,209	14,875
Women	3,313	3,583	3,801	4,023	4,145	4,495	4,587	4,682	4,942	5,103	5,382
White	12,772	12,733	12,832	13,132	13,093	13,325	13,053	12,875	12,920	12,831	13,244
Black	437	470	483	519	507	505	556	538	477	454	487
Asian	1,901	2,051	2,046	2,099	2,222	2,367	2,628	2,884	2,957	3,333	3,740
Native American	22	29	26	26	37	28	31	40	50	50	43
Hispanic	420	488	465	545	483	516	532	563	611	627	673
Sciences, total	14,625	14,755	14,720	15,105	14,984	15,195	15,194	15,157	15,483	15,600	16,067
Men	11,365	11,234	11,009	11,181	10,963	10,824	10,758	10,673	10,766	10,739	10,971
Women	3,260	3,521	3,711	3,924	4,021	4,371	4,436	4,484	4,717	4,861	5,096
White	11,285	11,303	11,405	11,735	11,665	11,822	11,549	11,326	11,218	10,998	11,181
Black	404	416	426	461	454	438	490	466	428	398	420
Asian	1,271	1,337	1,320	1,321	1,411	1,492	1,629	1,752	1,857	2,048	2,283
Native Amer	20	25	23	22	34	27	28	39	44	42	39
Hispanic	343	403	389	453	395	416	452	477	516	531	549
Physical sciences	2,611	2,674	2,521	2,627	2,694	2,802	2,845	2,916	3,090	3,212	3,320
Men	2,364	2,382	2,199	2,318	2,337	2,431	2,446	2,452	2,585	2,686	2,761
Women	247	292	322	309	357	371	399	464	505	526	559
White	1,863	1,900	1,776	1,858	1,991	2,077	2,013	2,053	2,028	2,128	2,105
Black	50	51	30	36	44	41	56	46	44	37	50
Asian	400	407	419	425	441	442	500	519	622	648	726
Native American	4	1	3	1	3	6	4	3	5	7	6
Hispanic	53	55	48	60	49	60	82	75	88	95	96
Mathematics	838	769	744	728	720	701	698	688	729	740	749
Men	718	650	649	616	624	588	583	582	608	615	628
Women	120	119	95	112	96	113	115	106	121	125	121
White	631	571	554	519	521	485	468	447	444	421	437
Black	15	12	14	18	12	5	8	11	12	18	7
Asian	102	104	107	121	108	122	137	140	153	172	183
Native American	1	0	0	1	1	0	3	0	1	0	2
Hispanic	25	29	16	24	23	26	38	31	38	34	28
Computer sciences	121	210	218	232	220	286	295	310	399	450	514
Men	110	183	197	206	200	250	258	277	351	385	458
Women	11	27	21	26	20	36	37	33	48	65	56
White	86	168	166	185	162	207	193	208	232	269	309
Black	1	2	0	3	1	4	6	3	4	3	4
Asian	16	21	23	28	42	51	71	66	105	112	157
Native American	0	1	0	0	1	1	0	0	0	3	1
Hispanic	1	5	4	2	4	6	5	8	12	10	7

Table 47. - continued

Field, gender, and racial/ethnic group	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Earth, atmospheric, and marine sciences	623	646	628	583	657	637	614	617	589	628	726
Men	562	588	564	527	554	540	508	506	489	514	582
Women	61	58	64	56	103	97	106	111	100	114	144
White	502	528	516	491	541	487	500	475	455	448	536
Black	8	6	5	12	10	12	9	6	4	3	7
Asian	45	47	48	35	61	70	64	78	64	75	85
Native American	0	2	2	0	0	2	0	1	2	0	2
Hispanic	11	16	20	12	15	22	13	14	7	22	20
Life sciences	4,369	4,501	4,715	4,786	4,844	4,756	4,877	4,902	4,806	4,813	5,121
Men	3,411	3,470	3,565	3,565	3,552	3,390	3,529	3,494	3,354	3,284	3,434
Women	958	1,031	1,150	1,221	1,292	1,366	1,348	1,408	1,452	1,529	1,687
White	3,352	3,474	3,693	3,737	3,863	3,799	3,835	3,780	3,633	3,504	3,691
Black	105	97	126	140	121	119	140	142	129	118	131
Asian	446	426	407	402	420	453	465	518	508	586	652
Native American	8	3	6	7	10	5	11	17	18	13	12
Hispanic	104	146	140	173	136	129	119	172	161	175	205
Psychology	3,055	3,091	3,098	3,358	3,159	3,347	3,257	3,117	3,124	3,177	3,058
Men	1,928	1,831	1,787	1,885	1,721	1,750	1,626	1,576	1,526	1,478	1,383
Women	1,127	1,260	1,311	1,473	1,438	1,597	1,631	1,541	1,598	1,699	1,675
White	2,562	2,587	2,612	2,897	2,680	2,826	2,732	2,637	2,589	2,571	2,458
Black	102	120	121	116	120	113	122	108	112	97	106
Asian	41	50	59	56	40	72	67	63	61	62	74
Native American	3	10	6	9	16	9	6	10	9	16	7
Hispanic	54	58	60	73	77	101	96	73	100	104	98
Social sciences	3,008	2,864	2,796	2,791	2,690	2,666	2,608	2,607	2,746	2,580	2,579
Men	2,272	2,130	2,048	2,064	1,975	1,875	1,808	1,786	1,853	1,777	1,725
Women	736	734	748	727	715	791	800	821	893	803	854
White	2,289	2,075	2,088	2,048	1,907	1,941	1,808	1,726	1,837	1,657	1,645
Black	123	128	130	136	146	144	149	150	123	122	115
Asian	221	282	257	254	299	282	325	368	344	393	406
Native American	4	8	6	4	3	4	4	8	9	3	9
Hispanic	95	94	101	109	91	72	99	104	110	91	95
Engineering, total	2,423	2,490	2,479	2,528	2,646	2,781	2,913	3,166	3,376	3,712	4,190
Men	2,370	2,428	2,389	2,429	2,522	2,657	2,762	2,968	3,151	3,470	3,904
Women	53	62	90	99	124	124	151	198	225	242	286
White	1,487	1,430	1,427	1,397	1,428	1,503	1,504	1,549	1,702	1,833	2,063
Black	33	54	57	58	53	67	66	72	49	56	67
Asian	630	714	726	778	811	875	999	1,132	1,100	1,285	1,457
Native American	2	4	3	4	3	1	3	1	6	8	4
Hispanic	77	85	76	92	88	100	80	86	95	96	124

Table 47. - continued

Field, gender, and racial/ethnic group	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
	U.S. citizens										
Total, all fields	13,086	13,257	13,179	13,298	13,022	13,103	12,977	12,676	12,615	12,563	12,847
Men	10,294	10,213	9,908	9,884	9,488	9,267	9,117	8,857	8,651	8,566	8,733
Women	2,792	3,044	3,271	3,414	3,534	3,836	3,860	3,819	3,964	3,997	4,114
White	11,484	11,601	11,647	11,873	11,805	11,866	11,684	11,424	11,406	11,260	11,559
Black	278	288	261	273	270	269	282	260	238	222	231
Asian	275	301	323	327	318	341	380	371	394	440	441
Native American	21	28	26	26	37	27	31	40	49	49	43
Hispanic	180	173	166	191	219	221	250	237	264	293	319
Sciences, total	11,825	11,964	11,924	12,128	11,853	11,940	11,738	11,397	11,232	11,005	11,069
Men	9,063	8,959	8,717	8,767	8,393	8,187	7,966	7,697	7,410	7,157	7,133
Women	2,762	3,005	3,207	3,361	3,460	3,753	3,772	3,700	3,822	3,848	3,936
White	10,410	10,516	10,579	10,864	10,790	10,850	10,622	10,327	10,177	9,929	10,032
Black	269	271	250	257	261	250	270	241	224	210	212
Asian	212	232	250	250	246	275	285	281	314	305	300
Native Amer	19	25	23	22	34	27	28	39	43	42	39
Hispanic	141	158	148	179	196	203	228	221	239	269	276
Physical sciences	1,978	2,040	1,884	1,956	1,991	2,064	2,071	2,043	2,014	2,080	2,094
Men	1,800	1,826	1,654	1,732	1,727	1,779	1,768	1,720	1,682	1,719	1,731
Women	178	214	230	224	264	285	303	323	332	361	363
White	1,699	1,754	1,632	1,724	1,827	1,879	1,854	1,850	1,817	1,888	1,876
Black	35	34	13	19	21	19	28	23	20	16	28
Asian	53	52	54	46	56	66	77	76	75	67	66
Native American	4	1	3	1	3	6	4	3	5	7	6
Hispanic	17	25	20	26	21	24	38	26	35	48	56
Mathematics	619	552	520	482	458	411	407	376	366	345	341
Men	528	460	447	402	386	335	333	306	297	280	282
Women	91	92	73	80	72	76	74	70	69	65	59
White	547	486	469	429	419	374	366	337	326	295	308
Black	12	11	11	7	6	3	3	3	5	10	1
Asian	15	18	12	20	11	13	9	14	14	18	17
Native American	1	0	0	1	1	0	3	0	1	0	2
Hispanic	5	6	3	4	6	4	11	7	9	9	3
Computer sciences	85	163	156	168	143	180	178	189	202	243	284
Men	78	137	137	148	126	153	153	165	165	193	245
Women	7	26	19	20	17	27	25	24	37	50	39
White	74	148	138	154	134	161	155	170	176	215	253
Black	0	1	0	2	1	3	2	2	0	2	1
Asian	2	3	2	4	2	6	12	2	12	10	20
Native American	0	1	0	0	1	1	0	0	0	3	1
Hispanic	0	1	1	0	1	0	3	5	4	4	2

Table 47. - continued

Field, gender, and racial/ethnic group	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Earth, atmospheric, and marine sciences	518	532	512	472	528	483	474	442	422	425	507
Men	464	482	456	425	436	402	378	354	344	342	392
Women	54	50	56	47	92	81	96	88	78	83	115
White	460	488	476	443	498	443	449	415	398	395	476
Black	4	2	1	3	2	1	2	2	0	1	2
Asian	11	4	7	4	12	8	8	8	6	9	8
Native American	0	2	2	0	0	2	0	1	2	0	2
Hispanic	4	5	3	6	6	9	1	4	5	3	8
Life sciences	3,522	3,674	3,849	3,891	3,964	3,859	3,910	3,829	3,704	3,568	3,658
Men	2,744	2,814	2,871	2,859	2,851	2,688	2,773	2,678	2,513	2,375	2,373
Women	778	860	978	1,032	1,113	1,171	1,137	1,151	1,191	1,193	1,285
White	3,132	3,283	3,450	3,515	3,632	3,560	3,590	3,513	3,383	3,239	3,360
Black	57	41	49	52	48	49	55	49	47	52	44
Asian	78	88	93	98	104	116	110	114	137	123	109
Native American	7	3	6	7	10	5	11	17	17	13	12
Hispanic	34	38	30	42	50	41	43	59	59	65	74
Psychology	2,804	2,850	2,859	3,111	2,876	3,044	2,935	2,805	2,766	2,752	2,641
Men	1,770	1,700	1,637	1,746	1,556	1,576	1,440	1,396	1,330	1,262	1,179
Women	1,034	1,150	1,222	1,365	1,320	1,468	1,495	1,409	1,436	1,490	1,462
White	2,492	2,522	2,533	2,819	2,607	2,740	2,652	2,552	2,509	2,480	2,382
Black	96	112	115	111	112	110	115	101	102	88	96
Asian	17	29	40	33	25	35	32	34	32	38	37
Native American	3	10	6	9	16	9	6	10	9	16	7
Hispanic	44	42	51	59	69	84	81	64	81	92	89
Social sciences	2,299	2,153	2,144	2,048	1,893	1,899	1,763	1,713	1,758	1,592	1,544
Men	1,679	1,540	1,515	1,455	1,311	1,254	1,121	1,078	1,079	986	931
Women	620	613	629	593	582	645	642	635	679	606	613
White	2,006	1,835	1,881	1,780	1,673	1,693	1,556	1,490	1,568	1,417	1,377
Black	65	70	61	63	71	65	65	61	50	41	40
Asian	36	38	42	45	36	31	37	33	38	40	43
Native American	4	8	6	4	3	4	4	8	9	3	9
Hispanic	37	41	40	42	43	41	51	56	46	48	44
Engineering, total	1,261	1,293	1,255	1,170	1,169	1,163	1,239	1,279	1,383	1,558	1,778
Men	1,231	1,254	1,191	1,117	1,095	1,080	1,151	1,160	1,241	1,409	1,600
Women	30	39	64	53	74	83	88	119	142	149	178
White	1,074	1,085	1,068	1,009	1,015	1,016	1,062	1,097	1,229	1,331	1,527
Black	9	17	11	16	9	19	12	19	14	12	19
Asian	63	69	73	77	72	66	95	90	80	135	141
Native American	2	3	3	4	3	0	3	1	6	7	4
Hispanic	19	15	18	12	23	18	22	16	25	24	43

Table 47. - continued

Field, gender, and racial/ethnic group	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
	Non-U.S. citizen, permanent residents										
Total, all fields	970	927	935	876	834	877	817	899	969	1,064	1,095
Men	807	765	748	704	677	698	657	719	768	813	848
Women	163	162	187	172	157	179	160	180	201	251	247
White	329	281	293	293	290	352	320	333	394	431	434
Black	31	21	44	43	43	36	54	71	61	67	75
Asian	551	564	533	487	433	430	382	428	402	474	457
Native American	0	0	0	0	0	1	0	0	0	0	0
Hispanic	39	47	41	39	42	42	40	43	63	49	67
Sciences, total	645	605	636	575	538	558	543	584	626	709	729
Men	488	448	459	418	395	387	396	421	445	483	500
Women	157	157	177	157	143	171	147	163	181	226	229
White	234	211	218	209	205	240	225	242	269	304	310
Black	27	18	37	40	32	26	51	56	51	54	63
Asian	342	327	328	279	259	249	227	237	220	282	266
Native Amer	0	0	0	0	0	0	0	0	0	0	0
Hispanic	26	38	32	35	29	31	28	37	53	39	47
Physical sciences	183	165	151	147	119	120	119	135	133	147	137
Men	155	132	110	119	99	99	97	112	94	110	97
Women	28	33	41	28	20	21	22	23	39	37	40
White	51	33	29	33	32	38	34	50	41	54	46
Black	2	3	3	5	5	6	6	4	5	4	5
Asian	126	116	110	103	75	70	67	74	71	76	71
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	3	8	7	4	4	2	9	4	5	8	6
Mathematics	47	51	62	43	41	46	36	42	36	51	43
Men	42	44	49	37	33	36	24	30	32	39	32
Women	5	7	13	6	8	10	12	12	4	12	11
White	16	19	27	19	18	21	14	13	17	24	23
Black	1	0	1	2	0	0	1	4	1	1	2
Asian	28	28	30	20	21	21	21	19	14	23	16
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	0	4	2	1	0	3	0	5	3	2	1
Computer sciences	5	12	13	20	12	27	17	24	47	32	42
Men	5	11	12	16	12	24	15	24	41	28	35
Women	0	1	1	4	0	3	2	0	6	4	7
White	3	5	5	8	2	13	8	7	17	14	12
Black	0	0	0	0	0	0	1	1	1	0	1
Asian	2	6	7	12	10	14	8	15	25	16	24
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	0	1	0	0	0	0	0	1	3	0	0

Table 47. - continued

Field, gender, and racial/ethnic group	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Earth, atmospheric, and marine sciences	22	34	26	16	29	30	25	32	24	25	30
Men	20	32	22	15	25	23	24	28	21	18	26
Women	2	2	4	1	4	7	1	4	3	7	4
White	6	14	9	5	12	10	12	15	15	13	19
Black	0	1	0	1	1	0	1	2	1	1	1
Asian	14	17	15	10	15	18	11	13	8	9	7
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	1	1	1	0	1	2	1	2	0	2	0
Life sciences	185	161	186	159	140	150	149	151	165	208	262
Men	129	105	131	104	90	94	95	99	117	131	173
Women	56	56	55	55	50	56	54	52	48	77	89
White	56	50	61	51	46	48	56	57	62	75	112
Black	9	3	9	9	8	9	13	20	17	21	24
Asian	110	100	105	83	78	81	68	61	53	85	91
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	5	6	6	14	4	8	9	12	24	13	23
Psychology	54	45	50	47	47	64	51	59	65	59	59
Men	33	22	30	21	23	29	26	29	32	18	26
Women	21	23	20	26	24	35	25	30	33	41	33
White	32	28	29	30	31	43	31	38	38	40	39
Black	4	3	4	2	3	2	6	4	7	5	4
Asian	11	7	10	8	6	9	11	10	9	9	10
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	7	7	3	7	5	10	3	5	8	3	4
Social sciences	149	137	148	143	150	121	146	141	156	187	156
Men	104	102	105	106	113	82	115	99	108	139	111
Women	45	35	43	37	37	39	31	42	48	48	45
White	70	62	58	63	64	67	70	62	79	84	59
Black	11	8	20	21	15	9	23	21	19	22	26
Asian	51	53	51	43	54	36	41	45	40	64	47
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	10	11	13	9	15	6	6	8	10	11	13
Engineering, total	325	322	299	301	296	319	274	315	343	355	366
Men	319	317	289	286	282	311	261	298	323	330	348
Women	6	5	10	15	14	8	13	17	20	25	18
White	95	70	75	84	85	112	95	91	125	127	124
Black	4	3	7	3	11	10	3	15	10	13	12
Asian	209	237	205	208	174	181	155	191	182	192	191
Native American	0	0	0	0	0	1	0	0	0	0	0
Hispanic	13	9	9	4	13	11	12	6	10	10	20

Table 47. - continued

Field, gender, and racial/ethnic group	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
	Non-U.S. citizen, temporary residents										
Total, all fields	2,806	2,606	2,643	2,892	3,051	3,328	3,609	3,960	4,056	4,364	4,838
Men	2,254	2,336	2,394	2,574	2,742	2,995	3,201	3,466	3,530	3,815	4,179
Women	252	270	249	318	309	333	408	494	526	549	659
White	959	851	892	966	998	1,107	1,049	1,118	1,120	1,140	1,251
Black	128	161	178	203	194	200	220	207	178	165	181
Asian	1,075	1,186	1,190	1,285	1,471	1,596	1,866	2,085	2,161	2,419	2,842
Native American	1	1	0	0	0	0	0	0	1	1	0
Hispanic	221	268	258	315	222	253	242	283	284	285	287
Sciences, total	2,038	1,791	1,792	1,950	2,021	2,158	2,340	2,541	2,684	2,832	3,115
Men	1,802	1,538	1,558	1,661	1,743	1,851	1,975	2,103	2,207	2,337	2,526
Women	236	253	234	289	278	307	365	438	477	495	589
White	641	576	608	662	670	732	702	757	772	765	839
Black	108	127	139	164	161	162	169	169	153	134	145
Asian	717	778	742	792	906	968	1,117	1,234	1,323	1,461	1,717
Native Amer	1	0	0	0	0	0	0	0	1	0	0
Hispanic	176	207	209	239	170	182	196	219	224	223	226
Physical sciences	397	415	426	442	506	539	564	620	758	798	862
Men	357	375	380	392	442	480	501	525	644	703	735
Women	40	40	46	50	64	59	63	95	114	95	127
White	113	113	115	101	132	160	125	153	170	186	183
Black	13	14	14	12	18	16	22	19	19	17	17
Asian	221	239	255	276	310	306	356	369	476	505	589
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	33	22	21	30	24	34	35	45	48	39	34
Mathematics	155	149	139	186	192	209	232	238	272	302	304
Men	133	130	130	162	179	185	207	216	234	260	262
Women	22	19	9	24	13	24	25	22	38	42	42
White	68	66	58	71	84	90	88	97	101	102	106
Black	2	1	2	9	6	2	4	4	6	7	4
Asian	59	58	65	81	76	88	107	107	125	131	150
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	20	19	11	19	17	19	27	19	26	23	24
Computer sciences	26	32	43	40	59	72	89	89	123	143	174
Men	23	32	42	38	56	66	81	81	119	138	166
Women	3	0	1	2	3	6	8	8	4	5	8
White	9	15	23	23	26	33	30	31	39	40	44
Black	1	1	0	1	0	1	3	0	3	1	2
Asian	12	12	14	12	30	31	51	49	68	86	113
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	1	3	3	2	3	6	2	2	5	6	5

Table 47. - continued

Field, gender, and racial/ethnic group	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Earth, atmospheric, and marine sciences	68	71	80	85	81	106	106	119	106	125	137
Men	65	66	76	78	76	99	97	106	93	112	124
Women	3	5	4	7	5	7	9	13	13	13	13
White	36	26	31	43	31	34	39	45	42	40	41
Black	4	3	4	8	7	11	6	2	3	1	4
Asian	20	26	26	21	34	44	45	57	50	57	70
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	6	10	16	6	8	11	11	8	2	17	12
Life sciences	559	562	592	613	603	629	675	779	711	780	898
Men	462	472	508	512	503	520	550	608	558	581	677
Women	97	90	84	101	100	109	125	171	153	199	221
White	164	141	182	171	185	191	189	210	188	190	219
Black	39	53	68	79	65	61	72	73	65	45	63
Asian	258	238	209	221	238	256	287	343	318	378	452
Native American	1	0	0	0	0	0	0	0	1	0	0
Hispanic	65	102	104	117	82	80	67	101	78	97	108
Psychology	61	73	71	80	65	79	88	81	81	85	84
Men	44	43	48	48	42	48	53	53	47	48	48
Women	17	30	23	32	23	31	35	28	34	37	36
White	38	37	50	48	42	43	49	47	42	51	37
Black	2	5	2	3	5	1	1	3	3	4	6
Asian	13	14	9	15	9	28	24	19	20	15	27
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	3	9	6	7	3	7	12	4	11	9	5
Social sciences	472	489	441	504	515	524	586	615	633	599	656
Men	418	420	374	431	445	453	486	514	512	495	514
Women	54	69	67	73	70	71	100	101	121	104	142
White	213	178	149	205	170	181	182	174	190	156	209
Black	47	50	49	52	60	70	61	68	54	59	49
Asian	134	191	164	166	209	215	247	280	266	289	316
Native American	0	0	0	0	0	0	0	0	0	0	0
Hispanic	48	42	48	58	33	25	42	40	54	32	38
Engineering, total	768	815	851	942	1,030	1,170	1,269	1,419	1,372	1,532	1,723
Men	752	798	836	913	999	1,144	1,226	1,363	1,323	1,478	1,653
Women	16	17	15	29	31	26	43	56	49	54	70
White	318	275	284	304	328	375	347	361	348	375	412
Black	20	34	39	39	33	38	51	38	25	31	36
Asian	358	408	448	493	565	628	749	851	838	958	1,125
Native American	0	1	0	0	0	0	0	0	0	1	0
Hispanic	45	61	49	76	52	71	46	64	60	63	61

(1) Totals for racial/ethnic groups do not include individuals whose citizenship status is unknown.

SOURCE: National Science Foundation, SRS.

Table 48. Primary sources of graduate support reported by 1988 science and engineering doctorate recipients, by source, field, gender, and racial/ethnic group

Field	Total known support	Family support	University					Federal support	Student loan	Other
			Total	Teaching assistantship	Research assistantship	Fellowship	Other			
	Total									
Total, all fields	16,846	4,008	8,181	3,090	4,027	802	262	2,792	603	1,262
Sciences, total	13,389	3,490	6,286	2,651	2,757	660	218	2,230	574	809
Physical sciences	2,723	274	1,691	675	907	98	11	612	27	119
Mathematics	635	84	462	356	69	31	6	26	8	55
Computer sciences	447	103	227	99	113	9	6	61	6	50
Earth, atmospheric, and marine sciences	596	115	286	82	173	24	7	144	6	45
Life sciences	4,351	848	1,995	586	1,060	261	88	1,107	80	321
Psychology	2,543	1,283	687	323	206	86	72	143	379	51
Social sciences	2,094	783	938	530	229	151	28	137	68	168
Engineering, total	3,457	518	1,895	439	1,270	142	44	562	29	453
	Men									
Total, all fields	12,302	2,602	6,244	2,308	3,224	559	153	2,083	318	1,055
Sciences, total	9,087	2,104	4,486	1,906	2,036	430	114	1,574	292	631
Physical sciences	2,258	240	1,400	549	754	86	11	505	19	94
Mathematics	528	66	382	294	57	25	6	24	8	48
Computer sciences	400	87	204	86	108	6	4	58	2	49
Earth, atmospheric, and marine sciences	478	100	218	67	133	14	4	116	5	39
Life sciences	2,897	567	1,308	373	724	163	48	715	54	253
Psychology	1,151	563	334	165	107	35	27	68	163	23
Social sciences	1,375	481	640	372	153	101	14	88	41	125
Engineering, total	3,215	498	1,758	402	1,188	129	39	509	26	424
	Women									
Total, all fields	4,544	1,406	1,937	782	803	243	109	709	285	207
Sciences, total	4,302	1,386	1,800	745	721	230	104	656	282	178
Physical sciences	465	34	291	126	153	12	0	107	8	25
Mathematics	107	18	80	62	12	6	0	2	0	7
Computer sciences	47	16	23	13	5	3	2	3	4	1
Earth, atmospheric, and marine sciences	118	15	68	15	40	10	3	28	1	6
Life sciences	1,454	281	687	213	336	98	40	392	26	68
Psychology	1,392	720	353	158	99	51	45	75	216	28
Social sciences	719	302	298	158	76	50	14	49	27	43
Engineering, total	242	20	137	37	82	13	5	53	3	29

Table 48. - continued

Field	Total known support	Family support	University: Total	University: Teaching assistantship	University: Research assistantship	University: Fellowship	University: Other	Federal support	Student loan	Other
					White					
Total, all fields	12,067	3,288	5,463	2,091	2,586	575	211	2,104	532	680
Sciences, total	10,182	2,960	4,539	1,907	1,972	482	178	1,751	510	422
Physical sciences	1,895	233	1,130	431	621	70	8	440	19	74
Mathematics	406	68	280	216	42	17	5	14	7	37
Computer sciences	283	74	128	54	63	6	5	44	6	31
Earth, atmospheric, and marine sciences	483	106	225	70	133	18	4	120	6	26
Life sciences	3,364	709	1,520	485	774	193	68	919	72	144
Psychology	2,259	1,161	606	285	185	71	65	110	345	37
Social sciences	1,492	609	650	366	154	107	23	104	55	74
Engineering, total	1,885	328	924	184	614	93	33	353	22	258
					Black					
Total, all fields	435	120	177	62	75	31	9	55	18	65
Sciences, total	374	108	148	51	63	26	8	50	18	50
Physical sciences	49	1	27	13	12	2	0	9	1	11
Mathematics	7	2	4	3	1	0	0	1	0	0
Computer sciences	4	2	1	0	1	0	0	1	0	0
Earth, atmospheric, and marine sciences	5	0	3	3	0	0	0	1	0	1
Life sciences	118	22	50	9	31	7	3	23	2	21
Psychology	90	43	24	5	8	7	4	11	10	2
Social sciences	101	38	39	18	10	10	1	4	5	15
Engineering, total	61	12	29	11	12	5	1	5	0	15
					Asian					
Total, all fields	3,213	386	2,054	754	1,134	139	27	461	11	301
Sciences, total	1,942	245	1,225	547	551	106	21	292	6	174
Physical sciences	596	25	427	189	214	21	3	124	1	19
Mathematics	163	7	141	109	21	11	0	8	0	7
Computer sciences	135	23	86	40	42	3	1	15	0	11
Earth, atmospheric, and marine sciences	73	6	43	7	28	5	3	15	0	9
Life sciences	567	74	307	70	188	38	11	109	1	76
Psychology	62	24	29	22	7	0	0	4	3	2
Social sciences	346	86	192	110	51	28	3	17	1	50
Engineering, total	1,271	141	829	207	583	33	6	169	5	127

Table 48. - continued

Field	Total known support	Family support	University					Federal support	Student loan	Other
			Total	Teaching assistantship	Research assistantship	Fellowship	Other			
	Native American									
Total, all fields	36	16	8	3	5	0	0	6	3	3
Sciences, total	32	15	7	2	5	0	0	5	3	2
Physical sciences	4	1	1	0	1	0	0	2	0	0
Mathematics	2	0	1	1	0	0	0	0	1	0
Computer sciences	1	1	0	0	0	0	0	0	0	0
Earth, atmospheric, and marine sciences	2	1	1	0	1	0	0	0	0	0
Life sciences	10	4	4	1	3	0	0	2	0	0
Psychology	7	4	0	0	0	0	0	1	1	1
Social sciences	6	4	0	0	0	0	0	0	1	1
Engineering, total	4	1	1	1	0	0	0	1	0	1
	Hispanic									
Total, all fields	605	117	230	80	111	31	8	97	28	133
Sciences, total	498	102	187	67	87	27	6	79	27	103
Physical sciences	85	8	41	20	19	2	0	22	3	11
Mathematics	28	3	18	14	2	1	1	1	0	6
Computer sciences	6	0	1	0	1	0	0	0	0	5
Earth, atmospheric, and marine sciences	15	0	5	1	4	0	0	4	0	6
Life sciences	189	26	76	9	50	14	3	32	3	52
Psychology	89	38	15	4	5	5	1	13	16	7
Social sciences	86	27	31	19	6	5	1	7	5	16
Engineering, total	107	15	43	13	24	4	2	18	1	30

NOTE: Data are for all degree recipients regardless of citizenship.

SOURCE: National Science Foundation, SRS.

Table 49. NSF fellowships in science and engineering, by field and gender: fiscal years 1975, 1985, and 1988

Field	FY 1975														
	Number of Applicants			Number of Awards Offererd									Honorable Mention		
				Total			New			Continuation (1)					
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total, all fields	5,773	3,995	1,778	1,527	1,137	390	550	404	146	977	733	244	2,078	1,544	534
Engineering, Mathematics, and Physical Sciences	2,480	2,081	399	679	614	65	239	213	26	440	401	39	888	807	81
Applied Mathematics	381	284	97	97	82	15	36	29	7	61	53	8	127	112	15
Astronomy	52	46	6	12	12	0	7	7	0	5	5	0	21	19	2
Chemistry	429	337	92	115	101	14	40	34	6	75	67	8	132	113	19
Earth Sciences	280	204	76	80	65	15	33	28	5	47	37	10	81	59	22
Engineering	684	642	42	188	176	12	63	58	5	125	118	7	273	264	9
Mathematics	263	192	71	86	82	4	24	22	2	62	60	2	87	79	8
Physics	391	376	15	101	96	5	36	35	1	65	61	4	167	161	6
Life and Medical Sciences	1,704	1,000	704	408	241	167	163	90	73	245	151	94	539	349	190
Biochemistry, Biophysics, Molecular Biology	395	268	127	89	60	29	35	24	11	54	36	18	128	96	32
Biological Sciences	815	480	335	218	135	83	77	46	31	141	89	52	266	172	94
Biomedical Sciences	494	252	242	101	46	55	51	20	31	50	26	24	145	81	64
Behavioral and Social Sciences	1,589	914	675	440	282	158	148	101	47	292	181	111	651	388	263
Anthropology and Sociology	522	252	270	156	92	64	49	30	19	107	62	45	326	170	156
Psychology	453	247	206	128	80	48	46	33	13	82	47	35	142	85	57
Social Sciences	614	415	199	156	110	46	53	38	15	103	72	31	183	133	50

Table 49. - continued

Field	FY 1985														
	Number of Applicants			Number of Awards Offererd									Honorable Mention		
				Total			New			Continuation					
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total, all fields	4,390	2,776	1,614	1,419	949	470	540	362	178	879	587	292	1,544	1,079	465
Engineering, Mathematics, and Physical Sciences	2,210	1,681	529	719	584	135	277	233	44	442	351	91	756	613	143
Applied Mathematics	355	262	93	112	101	11	45	41	4	67	60	7	169	139	30
Astronomy	30	27	3	10	9	1	3	3	0	7	6	1	5	5	0
Chemistry	337	219	118	114	87	27	41	32	9	73	55	18	95	72	23
Earth Sciences	239	151	88	91	53	38	29	20	9	62	33	29	86	50	36
Engineering	778	635	143	254	200	44	97	82	15	157	118	29	292	245	47
Mathematics	148	105	43	48	42	6	20	19	1	28	23	5	44	40	4
Physics	323	282	41	90	82	8	42	36	6	48	46	2	65	62	3
Life and Medical Sciences	1,347	698	649	431	224	207	163	79	84	268	145	123	455	277	178
Biochemistry, Biophysics, Molecular Biology	413	246	167	125	80	45	48	32	16	77	48	29	186	119	67
Biological Sciences	572	298	274	189	96	93	72	32	40	117	64	53	159	96	63
Biomedical Sciences	362	154	208	117	48	69	43	15	28	74	33	41	110	62	48
Behavioral and Social Sciences	833	397	436	269	141	128	100	50	50	169	91	78	333	189	144
Anthropology and Sociology	214	89	125	76	38	38	25	15	10	51	23	28	89	43	46
Psychology	288	108	180	87	32	55	35	10	25	52	22	30	103	45	58
Social Sciences	331	200	131	106	71	35	40	25	15	66	46	20	141	101	40

Table 49. - continued

Field	FY 1988														
				Number of Awards Offererd											
	Number of Applicants			Total			New			Continuation			Honorable Mention		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total, all fields	5,151	3,145	647	1,566	999	567	685	440	245	881	559	322	1,613	1,063	550
Engineering, Mathematics, and Physical Sciences	2,557	1,910	647	820	632	188	367	288	79	453	344	109	796	642	154
Applied Mathematics	126	71	55	36	29	7	17	13	4	19	16	3	38	24	14
Astronomy	33	24	9	7	6	1	3	3	0	4	3	1	12	10	2
Chemistry	402	246	156	131	86	45	54	31	23	77	55	22	119	83	36
Computer Sciences	271	223	48	95	73	22	40	34	6	55	39	16	81	74	7
Earth Sciences	173	117	56	66	42	24	24	16	8	42	26	16	46	31	15
Engineering	1,026	795	231	301	228	73	145	115	30	156	113	43	339	274	65
Mathematics	179	134	45	64	60	4	28	25	3	36	35	1	49	42	7
Physics	347	300	47	120	108	12	56	51	5	64	57	7	112	104	8
Life and Medical Sciences	1,546	752	794	438	209	229	186	88	98	252	121	131	577	301	276
Biochemistry, Biophysics, Molecular Biology	487	257	230	152	77	75	66	31	35	86	46	40	227	127	100
Biological Sciences	602	299	303	174	88	86	73	41	32	101	47	54	142	77	65
Biomedical Sciences	457	196	261	112	44	68	47	16	31	65	28	37	208	97	111
Behavioral and Social Sciences	1,048	483	565	308	158	150	132	64	68	176	94	82	240	120	120
Anthropology and Sociology	293	111	182	95	44	51	37	16	21	58	28	30	87	35	52
Psychology	327	121	206	93	39	54	41	15	26	52	24	28	100	47	53
Social Sciences	428	251	177	120	75	45	54	33	21	66	42	24	53	38	15

(1) Includes only those on tenure in 1975, excluding reinstatements.

SOURCE: National Science Foundation, unpublished data.

Table 50. NSF minority fellowships in science and engineering, by field: fiscal years 1980, 1985, and 1988

Field	FY 1980				
	Number of Applicants	Number of Awards Offered			Honorable Mention
		Total	New	Continuation	
Total, all fields	404	127	55	72	130
Engineering, Mathematics, and Physical Sciences	114	39	14	25	38
Applied Mathematics	19	5	3	2	7
Astronomy	1	0	0	0	0
Chemistry	16	12	4	8	6
Earth Sciences	12	1	0	1	4
Engineering	50	10	5	5	17
Mathematics	6	5	1	4	2
Physics	10	6	1	5	2
Life and Medical Sciences	115	38	15	23	39
Biochemistry, Biophysics, Molecular Biology	27	8	4	4	6
Biological Sciences	49	15	6	9	18
Biomedical Sciences	39	15	5	10	15
Behavioral and Social Sciences	175	50	26	24	53
Anthropology and Sociology	33	10	3	7	14
Psychology	67	20	11	9	16
Social Sciences	75	20	12	8	23

Table 50. - continued

Field	FY 1985				
	Number of Applicants	Number of Awards Offered			Honorable Mention
		Total	New	Continuation	
Total, all fields	612	159	60	99	196
Engineering, Mathematics, and Physical Sciences	243	54	22	32	91
Applied Mathematics	42	10	3	7	13
Astronomy	1	0	0	0	1
Chemistry	36	9	2	7	14
Earth Sciences	18	6	2	4	3
Engineering	112	23	11	12	52
Mathematics	17	3	2	1	7
Physics	17	3	2	1	1
Life and Medical Sciences	159	45	15	30	54
Biochemistry, Biophysics, Molecular Biology	31	12	4	8	12
Biological Sciences	70	22	8	14	21
Biomedical Sciences	58	11	3	8	21
Behavioral and Social Sciences	210	60	23	37	51
Anthropology and Sociology	32	15	5	10	8
Psychology	81	20	9	11	20
Social Sciences	97	25	9	16	23

Table 50. - continued

Field	FY 1988				
	Number of Applicants	Number of Awards Offered			Honorable Mention
		Total	New	Continuation	
Total, all fields	739	173	75	98	214
Engineering, Mathematics, and Physical Sciences	302	82	32	50	104
Applied Mathematics	21	5	1	4	7
Astronomy	1	1	0	1	1
Chemistry	48	16	6	10	19
Computer Sciences	29	8	3	5	12
Earth Sciences	13	2	2	0	6
Engineering	142	41	17	24	38
Mathematics	16	4	1	3	6
Physics	32	5	2	3	15
Life and Medical Sciences	213	38	19	19	52
Biochemistry, Biophysics, Molecular Biology	41	18	7	11	10
Biological Sciences	77	9	4	5	23
Biomedical Sciences	95	11	8	3	19
Behavioral and Social Sciences	224	53	24	29	58
Anthropology and Sociology	56	12	7	5	21
Psychology	73	18	8	10	24
Social Sciences	95	23	9	14	13

SOURCE: National Science Foundation, unpublished data.

Table 51. Postdoctorates in science and engineering, by field, gender, and racial/ethnic group: 1977, 1983, 1985, and 1987

Field	Total	Men	Women	White	Black	Asian	Native American	Hispanic
				1977				
Total, all fields	9,755	7,738	2,017	8,172	104	1,354	6	136
Scientists, total	9,353	7,351	2,002	7,931	99	1,211	6	135
Physical	2,577	2,262	315	2,078	14	459	1	29
Mathematical	78	69	9	71	0	7	0	0
Computer specialists	43	43	0	38	0	5	0	0
Environmental	357	324	33	320	0	29	2	7
Life	5,239	3,910	1,329	4,426	74	685	3	67
Psychologists	550	375	175	532	9	9	0	32
Social	509	368	141	466	2	17	0	0
Engineers, total	402	387	15	241	5	143	0	1
				1983				
Total, all fields	10,945	7,886	3,059	9,443	215	1,175	11	270
Scientists, total	10,620	7,588	3,032	9,318	215	975	11	212
Physical	1,951	1,674	277	1,631	69	242	0	30
Mathematical	103	82	21	101	0	2	0	0
Computer specialists	84	62	22	84	0	0	0	0
Environmental	326	278	48	288	0	17	0	7
Life	6,853	4,634	2,219	6,080	52	674	10	138
Psychologists	492	285	207	450	26	12	0	26
Social	811	573	238	684	68	28	1	11
Engineers, total	325	298	27	125	0	200	0	58
				1985				
Total, all fields	11,796	8,406	3,390	9,830	213	1,629	51	249
Scientists, total	11,398	8,031	3,367	9,691	213	1,370	51	247
Physical	2,303	1,968	335	1,723	94	484	0	55
Mathematical	117	109	8	113	2	2	0	4
Computer specialists	13	11	2	13	0	0	0	0
Environmental	373	331	42	312	4	35	0	24
Life	7,410	4,939	2,471	6,478	92	788	15	129
Psychologists	774	387	387	736	10	15	7	31
Social	408	286	122	316	11	46	29	4
Engineers, total	398	375	23	139	0	259	0	2
				1987				
Total, all fields	12,296	8,737	3,559	10,068	233	1,853	24	275
Scientists, total	11,677	8,147	3,530	9,725	220	1,598	24	260
Physical	2,533	2,143	390	1,802	44	650	0	56
Mathematical	286	259	27	219	4	60	0	9
Computer specialists	143	138	5	140	0	3	0	0
Environmental	427	354	73	380	0	46	1	1
Life sciences	7,263	4,693	2,570	6,257	119	808	12	167
Psychologists	664	334	330	623	16	22	0	24
Social	361	226	135	304	37	9	11	3
Engineers, total	619	590	29	343	13	255	0	15

SOURCE: National Science Foundation, SRS.